DEVOTED EXCLUSIVELY TO METALLIC SURFACE TREATMENTS

METAL FINISHING

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COMING SOON

A pictorial story of job shop plating operations for chrome plated tools.

Electroplated tin-zinc coatings, with comparative data on the corrosion resistance of various thicknesses of plating as compared to zinc and cadmium on steel.

An article on the important effects of small amounts of various additive compounds to electroplating baths.

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by Palmer H. Langdon, 1868-1935

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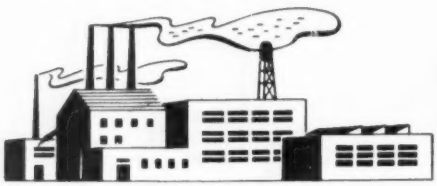

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In 1923 when Bob Leather introduced and patented his greaseless polishing compound, marketed under the trade name Lea Compound-Grade C, he made polishing history. This compound shifted the industry's dependence upon set-up wheel polishing with its limitations to much wider freedom in polishing methods. It made possible and started the trend toward flexible polishing so widely used today throughout industry.

Lea Greaseless Compound is marketed today in many grades, with Grade C being the most widely used. Lea Compound has maintained its leadership because of an insistence upon quality and uniformity in abrasives, in binders and in packaging. But even Lea Compound, excellent as it is, would not have reached its widespread usefulness without the help of Lea Technical service which has helped many companies to introduce better and more economical finishing methods.

Yes, you can buy imitation compounds. But if you want Lea Quality backed by Lea Technical service, be sure that the circular Lea Trademark is back of what you buy whether greaseless Lea Compound or "no free grease" Learok.

CORRECTION

In the Lea Mfg. Co.'s advertisement on the front cover of the February issue of Metal Finishing there was unfortunately an error in one of the figures used in connection with the LECTROMAG, a portable instrument for measuring plating thickness. The advertisement read: "non-magnetic coatings on carbon steel or iron ranging from 0.0002 to 0.0009 inches are measurable with the following accuracies: plus or minus 10% for thicknesses 0.001 inches and over; plus or minus 15% for thicknesses under 0.001 inches." The above range should have read: "from 0.0002 to 0.008 inches."

Burring, Buffing and Polishing . . . Manufacturers and Specialists in the Development of Production Methods, Equipment and Compositions

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370 VICTORIA STREET, TORONTO 2, CANADA

ESTABLISHED 1903

DEVOTED EXCLUSIVELY TO METALLIC SURFACE TREATMENTS

METAL FINISHING

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Motor City Plating News

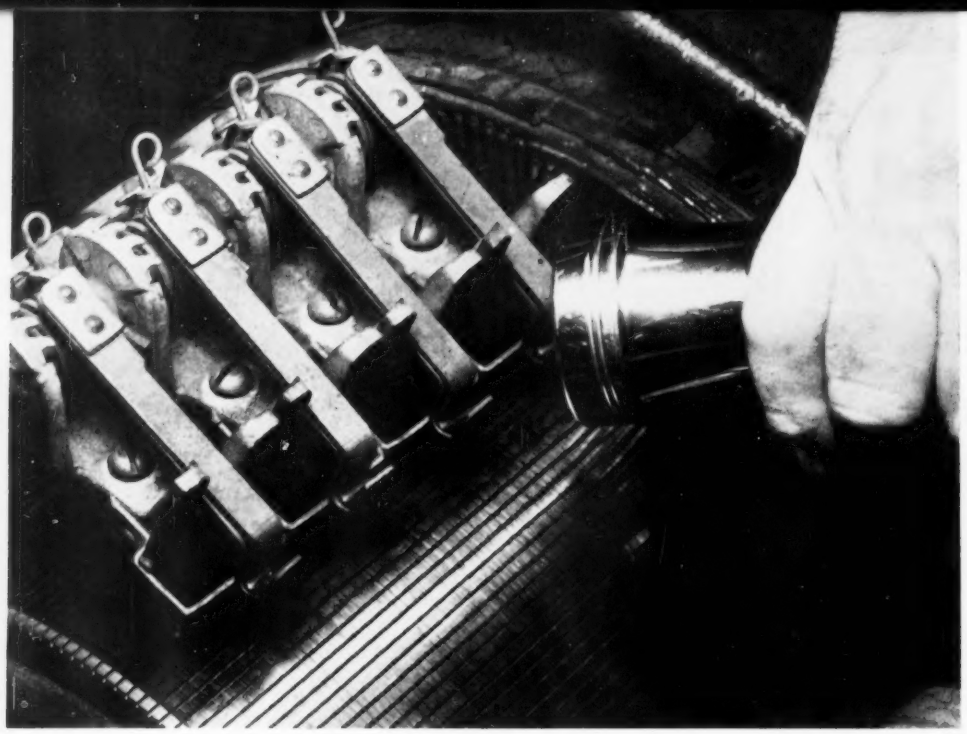
With this issue we are bringing to the readers of *Metal Finishing* a new feature page appropriately called "Motor City Plating News". This will henceforth become a regular monthly column, and will report on the happenings of interest to the metal finishing industry which are taking place in and around Detroit.

The addition of this new feature is based, of course, on the fact that Detroit is now, and has been for a number of years the heart of the plating industry in this country. The far-flung automotive "empire", with its contributing manufacturers and associated activities is the largest user of plated items and plating supplies, and to a large extent sets the pace for the finishing industry throughout the country. A major part of the important developments in the field originate there also, and the primary purpose of this new column will be to bring these developments to our readers' attention at the earliest possible moment.

Our correspondent in Detroit will be Mr. Edward Finnie, who has built up a wide acquaintance with the people and companies in this area while engaged in electroplating research, production and supervisory positions in several of the largest firms there.

We believe that this added feature will prove to be another in the progressive steps we are always attempting to make *Metal Finishing* the complete journal for the plating and finishing industry. Any suggestions or criticisms on this or any of our other regular features will be welcomed, as always.

W. A. Raymond



Maintenance of Electroplating Generators

By L. J. Mohler, *Small & Medium Motor Divs., General Electric Co., Schenectady, N. Y.*

DURING the last war, the metal finishing industry underwent tremendous expansion to provide for plating and finishing of the many machine tools, and aircraft and armament parts required by the war effort. Post-war conversion to the manufacture of peacetime products has resulted in a steadily increasing demand for all metal finishing crafts.

The metal finishing art is a versatile and complex one. Many varieties of machine equipments, chemical processes, mechanical operations, and electrical equipments are involved. The metal finishing plant operator must have a thorough grounding in metal finishing skills. Also, he must have a large amount of practical "horse sense" to make the busines pay a profit. The modern plating operator is, in most cases, a well-versed metallurgist or chemical engineer. He must also know something of the practical aspects of the electrical equipment which is necessary to all electroplating, electrolytic, electrocoloring, electropolishing, electrogalvanizing, and anodizing processes.

Considerable capital expenditure must be made in the purchase of the electrical equipment for any metal finishing operation. This represents an investment which is not to be taken lightly. Modern electrical equipments are sturdy and reliable, if not abused. In order to protect this investment, it is well to consider the fundamental rudiments of maintaining these equipments in excellent working order.

A motor-generator set will provide years of faithful and devoted service, provided it is given the necessary attention. We have all heard the old saying "It's not the first cost, it's the upkeep!" A little attention to the motor-generator set will minimize the upkeep, bringing dividends to the operator. On the other hand, a policy of neglect will accelerate depreciation of the investment and lead to costly production interruptions and high replacement cost.

Types of Maintenance

There are several kinds of maintenance. Quoting loosely from *Webster*, the word "maintenance" is defined as, "to keep in a condition of efficiency." For the purpose of this article, we will define basic maintenance as "planned preventive maintenance."

Another type of maintenance, which may be necessary if the basic type is not adopted, can be defined as "repair maintenance." Even though planned, preventive maintenance is strictly applied, there are possibilities of failure of a motor-generator equipment for reasons beyond the operator's control. Therefore, this article will touch lightly on repair maintenance.

Many of the remarks contained herein will apply to the general case, and it will be well to consider the size and importance of the operation, the usage ratio, the investment, and the availability of standyby equipment, before considering what recommendations must be adopted. Such an analysis can only be made by an experienced operator. However, suggestions contained herein will serve as a guide.

Planned Preventive Maintenance

There are several basic procedures which should be considered in maintaining motor-generator equipments. These may be listed:

1. Make regular inspections.
2. Keep maintenance records.
3. Maintain a nominal supply of renewal parts.
4. Keep electrical equipment clean and properly lubricated.

5. Keep loads within the nameplate rating of the motor-generator equipment.
6. Closely co-ordinate shut-down time of machines with Electrical Department so that maintenance inspections can be made during slack times.
7. Make an initial check on installations of all motor generator sets and controls.

Preventive Maintenance Inspection

Dampness, mild acid fumes, or excessive temperature and humidity will abnormally reduce the life of the insulation of motor and generator windings, leading to grounds or short-circuits. Units operating under adverse conditions must be given particular care with frequent inspection and maintenance. Thoughtful examinations by a conscientious service man making regular inspections are much more valuable than careless inspections at infrequent intervals. It is usually advisable to include routine inspections with the necessary visits of a lubrication man, as he must necessarily make regular trips, and consequently is in a good position to observe extraordinary noises, excess temperature, and other abnormal conditions of operation.

Necessary inspection schedules vary with conditions. These include consideration of the type or personnel constantly in attendance, the personnel available for making inspections, the importance of the equipment to the over-all processes, the equipment in shifting loads, the type of process to which the machine is supplying power, and other local conditions.

The following inspection schedule is a suggested routine. How it is placed in operation depends upon the foregoing factors and the applicability of the general rules to the specific operation.

General Locale

Take particular note of dripping liquids, process fumes, leaking solutions, as well as general cleanliness of the area. Make certain that no obstructions are present to prevent natural flow of ventilating air. Make certain that no loose objects are lying on or around the machine, such as hack saw blades which might fall into machine and cause short-circuits, etc. Make certain that machinery is clean and blown free of brush dust, lint, dirt, and liquids. Frequency—weekly.

Load Conditions

Make certain that the process operator is maintaining the electrical load on the equipment within the nameplate rating. Some processes requiring peak current load on periodic bases will produce short-time loads higher than nameplate rating; however, in every case where this is noted, a careful check of rms duty cycle should be made. Remember, overheating has a direct bearing on the life of the equipment.

Sleeve Bearings

Check the oil level and fill to the manufacturer's recommended level. Do this with motor-generator at standstill. Check to make certain that oil is not leaking from the bearing, especially making certain that the oil is not creeping along the shaft to the windings. Check position of oil rings and make certain that the bearing, when left, is such that oil rings are in place and freely ready for movement. Check oil ring action with motor generator operating. (Check oil ring action each time set is started.) Frequency—weekly.

Every 2 months, check condition of oil in wells and if evidence of sludging, flush with light oil and refill with the proper grade as recommended by the manufacturer. Check for evidences of bearing wear at stand-still, and check endplay with machine operating. This can best be done by pushing end of shaft with hardwood rounded rod (such as screwdriver handle), gently nudging shaft, and making certain that play from magnetic center will not touch bearing housing surfaces.

Ball or Roller Bearings

Ball or roller bearings are many times used on electroplating and finishing motor-generators. Check bearing housing with hand for evidence of vibration, and listen for any unusual noise, placing screwdriver point on bearing housing with ear at handle. Check for creepage of grease on inside of motor generator. Frequency—weekly.

Every 2 months, check quality and quantity of grease. Add grease only if needed. Where pressure relief system is provided, grease may be added where and if needed while set is operating, care being taken to relieve any excess pressure by temporarily removing the relief plug.

Brushes, Commutators, & Slip Rings

Check weekly all brushes for available wearing length, and check all pigtails for possible loose connections or frayed strands. Inspect commutators and rings for discoloration or roughness. Use commutator cleaning stick to clean surfaces. Take spot checks on brush wearing surface condition and if evidence of chipping, pitting, or oil and dirt, check all brushes replacing those in poor condition. Check for source of trouble. Watch for excessive sparking.

Every 2 months, check brush spring tension. Check brushes for fit and free play. Check brush stud tightness, making certain that studs are not displaced. Check commutator surface for high bars, high mica or evidence of roughness. Make certain that risers are clean and undamaged.

Rotors and Armatures

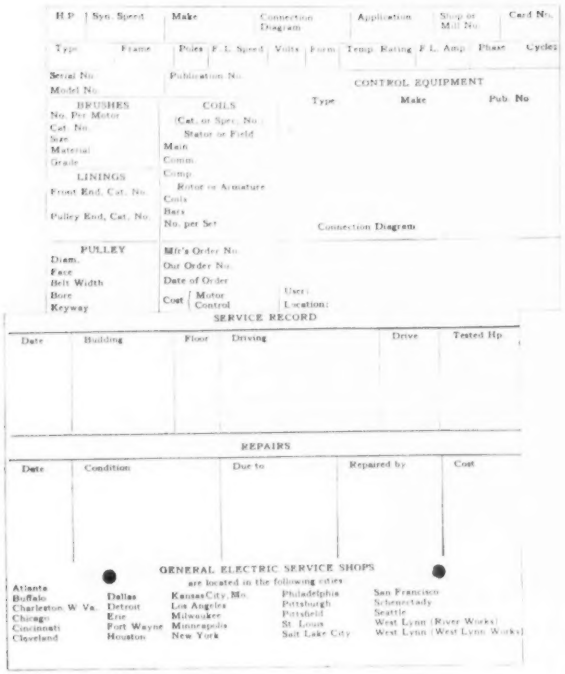
Check air gap on sleeve bearing machine, especially if recently overhauled. Make certain that the average air gap is within 10 per cent.

Make certain that air passage through the rotor punchings, if any, are free of obstructions. Clean thoroughly around collector rings and connections. Check tightness of connections. Check all top sticks or wedges for tightness. Make general visual inspection of binding wire, commutator risers, ammortisseur connections, etc. Frequency—every 2 months.

Windings

Clean weekly, if necessary, by mild blowing or suction. Wipe off dust with dry cloth.

Clean windings with carbon tetrachloride (sparingly applied). Check shunt, series and commutating fields for tightness. Check cable connections for tight-


H.P. | Syn. Speed | Make | Connection Diagram | Application | Shop or Mill No. | Card No.

Type | Frame | Poles | F. L. Speed | Volts | Form | Temp. Rating | F. L. Amp. | Phase | Cycles

Serial No. | Publication No. | CONTROL EQUIPMENT

Model No. | Type | Make | Pub. No

BRUSHES: No. Per Motor; Cat. No.; Size; Material; Grade

LININGS: Front End, Cat. No.; Pulley End, Cat. No.

COILS: (Cat. or Spec. No.); Stator or Field; Main; Comm.; Comp.; Rotor or Armature; Coils; Bars; No. per Set; Connection Diagram

PULLEY: Diam.; Face; Belt Width; Bore; Keyway

Mfr's Order No.; Our Order No.; Date of Order; Cost { Motor, Control }; User; Location;

SERVICE RECORD

Date	Building	Floor	Driving	Drive	Tested Hp.

REPAIRS

Date	Condition	Due to	Repaired by	Cost

GENERAL ELECTRIC SERVICE SHOPS are located in the following cities

Atlanta, Buffalo, Charleston, W. Va., Chicago, Cincinnati, Cleveland, Dallas, Detroit, Erie, Fort Wayne, Houston, Kansas City, Mo., Los Angeles, Milwaukee, Minneapolis, New York, Philadelphia, Pittsburgh, Pittsfield, St. Louis, Salt Lake City, San Francisco, Schenectady, Seattle, West Lynn (River Works), West Lynn (West Lynn Works)

Fig. 1—Typical service record card.

ness. Check field spools for rigidity, as changes in humidity and temperature may loosen. Check insulation resistance. Check all insulation surfaces for dry cracks. Varnish, treat and bake as needed if windings are dried out.

Mechanical Condition

Mechanical distress may be detected by ear or nose. Metal-to-metal contacts, or odor from scorching varnish is cause for immediate action.

Check couplings weekly for evidence of excessive wear in flexible factor, loose bolts, and general line-up.

Check pole bolts, stator mounting bolts, etc., every 2 months.

Maintenance Records

All data on principal electrical equipment should be carefully recorded at the time of purchase. Such records can, in many cases, be most efficiently made on small file cards which may also serve the purpose of inspection records. (A sample general-purpose card is shown in Fig. 1).

These cards serve the dual purpose of keeping all vital statistics together in condensed form for easy reference and emergency usage, as well as providing a complete service record on the reverse side. Analysis of the service record will in many cases lead to detection of progressive deterioration or be the basis for investigation of causes of necessity for repetitive maintenance.

Such condensed records are essential in obtaining emergency assistance from the manufacturer or repair shop.

Renewal Parts

There is nothing more exasperating to an operator than to have to keep a major electrical equipment shut down while waiting for renewal parts. These may, in some cases, have to be manufactured on an emergency basis by the original manufacturer of the machine, or in others by electrical parts manufacturers who are delayed in manufacture by the necessity of having to wait for the proper identification and drawings of the failed parts. Regardless of how much preventive maintenance is applied, there will be occasional cases of breakdown over which the operator will have no direct control. The operator who maintains a nominal supply of parts on hand will save money by not having to wait for manufacture and shipment of these parts when needed. He also saves money by ordering spare parts with the original machine, as these usually cost less to build than renewal parts built on a rush basis.

Here, again, the experience and judgment of the operator must dictate the requirements; however, parts may be selected from the following list, which is recommended for major equipments which cannot be shut down for extensive periods for repair.

D-C Machines

¼ set armature coils
1 set winding material
1 main field coil
1 commutating field coil and pole
1 set brushes
1 set bearing linings
1 set brushholder bracket insulation
1 set of pole face rods and insulation for one pole
1 set brushholders for 1-brushholder stud

A-C Synchronous Machine

⅓ set stator coils
2 rotor poles with coils
1 set brushes
1 set bearing linings

A-C Induction Machine

⅓ set stator coils
1 set bearing linings

Keeping Equipment Clean

There is no substitute for good housekeeping. This not only requires that equipment must be kept blown out to remove brush dust, airborne particles, etc. It follows that the whole area must be an example of good housekeeping. The writer recalls an occasion on which a maintenance repair man carelessly left a hacksaw blade on top of a large generator. After a few hours of operation the blade slowly gained a position of unbalance and dropped into the brushholder assembly. The effect necessitated costly repairs, but the shutdown time of the machine required by the accident was even more costly.

In addition, the periodic cleaning and revarnishing of windings, every year or two, depending upon operating conditions, will materially increase the life of the motor or generator. A vacuum cleaner is highly recommended for cleaning assembled machines.

Care of the Windings

Whenever a generator is disassembled for general

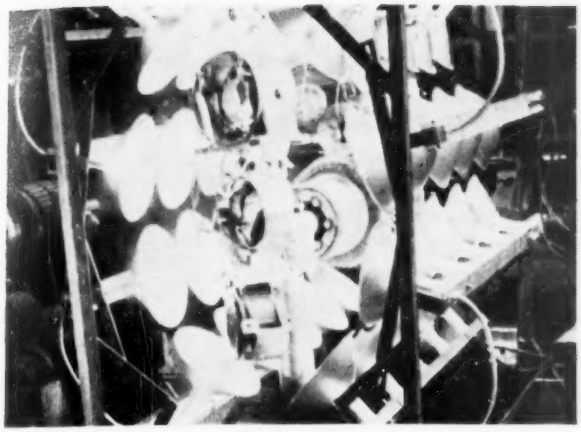


Fig. 11—Infra-red lamps being used to dry out windings of motor.

cleaning or other purposes, the insulation can be toned up by brushing the windings free of dust, followed by a washing with a cloth or brush, wet with carbon tetrachloride. Carbon tetrachloride is very volatile, and will not soak or injure the insulation *if not applied too generously*. Do not allow carbon tetrachloride to soak into brushes. Brushes are somewhat porous, and carbon tetrachloride may carry oil or dirt impurities into the brushes. Sanding of brushes may be required if this happens. Allow plenty of ventilation to avoid harm to workmen.

After washing, the insulation resistance should be measured with an insulation-resistance meter. Its reading in megohms should not be less than:

$$\frac{\text{Rated voltage}}{(\text{KW rating}) + 1000}$$

If the insulation-resistance is lower than this value, it is advisable to dry out the moisture. This can be done in a number of ways. If the unit is small, a large oven should be used, placing the unit in the oven at a temperature not exceeding 90° C until the insulation resistance becomes practically constant. Another method practical for larger machines is to enclose the unit with canvas or some other covering, leaving a hole at the top for moisture to escape, and using heating units or lamps to raise the temperature. Still another method is to pass a current at low voltage (with rotor locked) through the field windings. This current may be gradually increased until the winding temperature reaches 90° C.

When the winding is dry and still warm, high grade insulating varnish may be brushed or sprayed on the insulation. Complete parts should then be baked for six or seven hours at a temperature not exceeding 135° C, or the winding may be allowed to air-dry if an air-drying varnish is used. More than one coat may be required, depending upon the condition of the winding. (Insulating varnish and Glyptal varnish are recommended for dipping and baking armatures and field coils of rotating apparatus). Clear synthetic varnishes having high heat resistance and endurance, ability to penetrate windings and high dielectric strength, are recommended and are very satisfactory for first coats to fill the fibrous structure of the insulation. Glyptal varnish has excellent film building properties, is resistant to oil, and provides a hard, smooth surface finish to prevent adherence of dust particles to the windings. It also has good heat endurance and dielectric strength. Glyptal will air-dry if several days are allowed, or can be baked on at 90° C in several hours. If baking ovens are not available, a fair job can be done with Glyptal applied to the windings, making certain they are dry before applying the varnish.

To obtain the ultimate in satisfactory penetration, bonding and curing with these finishes, it is essential that their viscosity be maintained at certain prescribed values. This information can be obtained by writing the manufacturer.

Explanation of Total Temperature—°C

	Open	*Splash-proof*	*Totally Enclosed*
Ambient	40	40	40
Rise	40	50	55
O.L.	10	...	...
Hot-spot Allowance	15	15	10
Total at winding	105	105	105

Keeping Equipment Lubricated

In oiling sleeve bearing machines, use a good grade of mineral oil having a viscosity of 150 to 200 seconds Saybolt at 100 F. (corresponds to SAE #10). For abnormally high temperature operation, and very slow speed machines, slightly heavier oil with voscosity of 250 to 350 seconds Saybolt at 100 F. may be required (corresponds to S.A.E. #20). Turbine oils rather than automotive oils are recommended. Reputable oil companies should be consulted regarding special lubricants for unusual operating conditions.

For the convenience of the operator, a well designed set will have bearing housings which completely enclose the bearings and equipped with means for relubricating while running if and when conditions of operation dictate relubrication.

The following applies to ball bearing sets equipped with pressure gun grease fittings and pressure relief plugs:

1. Wipe clean the pressure gun fitting and the regions around the fitting and relief plug.
2. Remove the relief plug.
3. Free the relief hole of any hardened grease.
4. Add grease, with set running, until it is expelled through the relief hole. (If fittings are not safely accessible with the generator running, grease may be added sparingly with the generator at rest). Adding until new grease is expelled purges the housings of old grease.
5. Operate the set for about 20 minutes with the relief plug removed to expel excess grease.
6. Clean and replace the relief plug.

Exclusion of dirt from the housings and the lubricant is very important.

While cleaning of housings is seldom needed, depending upon the construction, housing and bearings of equipments may sometimes be cleaned without disassembly by flushing either with hot, light mineral oil, not hotter than 100° C, or with carbon tetrachloride.

The latter is not inflammable and dissolves grease more rapidly than hot oil. After flushing with carbon tetrachloride, it is important that the housing be rinsed with light mineral oil to remove small amounts of carbon tetrachloride trapped in the bearing spacer and housing, and to protect the clean bearing surfaces from atmospheric corrosion. Carbon tetrachloride should not be allowed to remain in contact with winding insulation in case of accidental splashing.

A good grade of lubricating grease should be used, having the following characteristics:

1.—ASTM—worked consistency 300-330, with minimum change over the operating temperatures.
2.—Melting point preferably above 150° C.
3.—Freedom from separation of oil and soap.
4.—Freedom from abrasive matter and acidity.

Peak Loads Within the Nameplate Rating

Major contributor to old age in the motor-generator equipment is the weakening and general aging of the insulation caused by prolonged thermal stress. Motor-generators operated over their nameplate current rating for any period of time will suffer. How important is over-temperature? Experience has shown that, within working limits, every 8° C increase in temperature over the maximum limit for the insulations approximately halves the life of the insulation for the length of time that insulation is operating at over temperature. Conversely, every 8° C decrease approximately doubles insulation life for the length of time that the insulation is at the lower temperature. This can graphically be shown in Fig. III. To determine the life expectancy of the insulation, with different total temperatures for different times, divide each of the percent times at a given total temperature by the percent life shown for each of those temperatures, and add. The reciprocal of this sum gives the approximate percent normal life expectancy under the assumed conditions expressed as a decimal.

Coordinate Shut-Down-Times of Machines

The intent of this basic procedure is obvious. Shut down during peak load periods is impractical and uneconomical. Maintenance functions and minor repairs should be made during slack times, so that the equipment will be in condition to handle the peak loads when required.

Initial Check of Installation

Some manufacturers provide field installation engineering service which will insure proper adjustments of the equipment. If this service is not included,

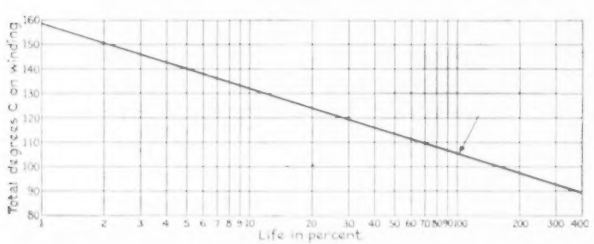


Fig. III—Operating Temperature of Insulation vs Life of Generators.

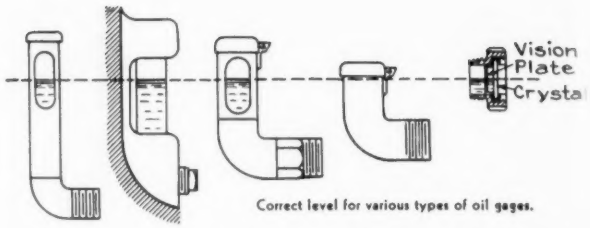


Fig. IV—Correct oil levels for various types of sight gauges.

the initial check on installation should be made by the operator accordng to the following brief summary:

All windings should be checked with an insulation resistance meter to make certain that dielectrics are satisfactory. All connections to generator and motor and control should be checked with connection diagram provided by the manufacturer. Some oil-lubricated sleeve bearing generators are shipped without oil. Sleeve bearing reservoirs should be filled, through the oil filler gage, to within 1/8 inch of the gage overflow level, with a good grade of mineral oil. (See Fig. IV.) Grease-lubricated, ball bearing equipments are usually shipped with bearing housings packed with grease. (See paragraph "keep the equipment properly lubricated").

Make certain that the rotor turns freely and does not rub when disconnected from the load. Any foreign material in the air gap should be removed.

If oil-ring bearings are used, make certain that the oil rings turn freely.

Before placing the motor-generator in service, it is advisable to operate without load long enough to determine that there is no unusual localized heating.

In starting up the equipment, make certain that the generator line switch is open, then insert all field resistance in series with the generator field. Then start the prime mover. As soon as the generator is up to speed, cut out the generator field resistance until normal voltage is obtained, then close the generator line switch.

When stopping the set, reduce the load, then open the generator line switch. Shut down the prime mover and insert all field resistance in series with the generator field.

Generator Brushes

Ask any maintenance man to name the most important part of a direct-current generator outside of the bearings, and he will invariably indicate that the brushes are vital. Let's take a little closer look at some of the difficulties and maintenance problems in connection with keeping brushes in such condition that they can carry the high currents required by electroplating, finishing, and other similar operations.

First, brushes must have a complete wearing surface available for bearing on the commutator for the purpose of carrying the current. Improper bearing on the commutator will lead to high brush surface densities which will give trouble.

If, upon inspection, a commutator appears to be dirty, it is usually cleaned. In many cases, however, the brushes are neglected. Usually, if a commutator needs cleaning the underside of the brushes should

also be cleaned. Figure V indicates deposits of oil and dirt on brush surfaces which should be removed.

When a commutator is rough and high mica is present, brush shatter invariably results. This causes fracturing of the trailing edge of the brush. Figure VI illustrates brushes which have been damaged because of roughness or high mica.

Brushes also have been damaged by sparking caused by incorrect and non-uniform brush spring

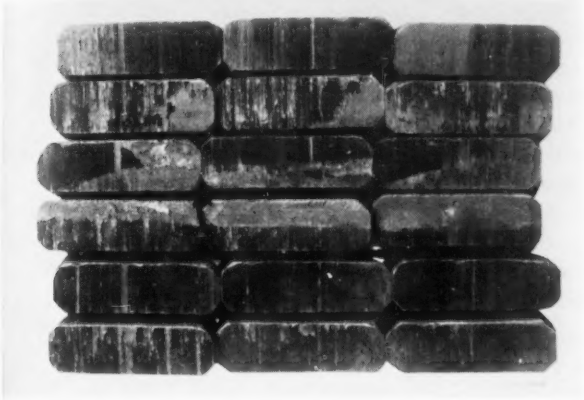


Fig. V—Deposits of oil and dirt on brush surfaces that should be cleaned off.

pressure. Such appearance is an immediate tip-off that the brush holder or springs are not in adjustment.

Brushes indicated in Fig. VII have been incorrectly seated due to excessive clearance in the brush holder, permitting two or more contacts on the commutator surface. This has resulted in sparking, and high temperature from overloading.

Manufacturers of brushes and manufacturers of rotating machinery have spent a considerable amount of time and gone to great expense in developing brushes and testing them for the particular process involved. Although operational experience with various types of brushes is undoubtedly the best criterion in their selection, manufacturers of electric

Fig. VI—Example of a set of brushes fractured as a result of brush chatter caused by high mica and rough commutator surface. Shown: brush surfaces which were against commutator.

machinery are in the best position to obtain data and make recommendations as to the particular type of brush required. For that reason, the manufacturer should be consulted whenever possible before making changes from original brush specifications.

It should be noted that in the early stages of operation of a new equipment, rapid wear is not uncommon. Just as in breaking in a new automobile, a commutator will improve with seasoning and age. Abrasion on brushes from dust, roughness, high commutator bars, high mica, and improper spring adjustments may be present in a new machine and must be corrected, just as adjustments must be obtained in a new automobile in occasional instances.

The proper brush angle varies with machines, and depends to a great degree upon commutator speed, direction of rotation, brush material, and other factors. Manufacturers' recommendations should be followed in all cases, in adjusting or reassembling brushholders for proper brush angle.

Direct-current generators have their brushes set approximately at the neutral point where the armature current reverses direction. The neutral point may shift under load. However, this shifting is minimized on

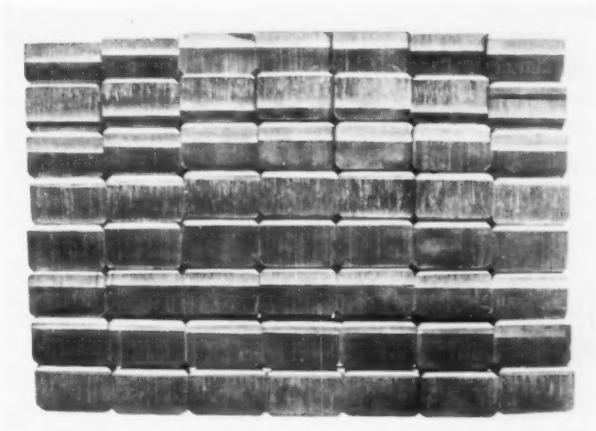


Fig. VII—Complete set of brushes that had excessive clearance in the holder, which permitted two or more fits on the commutator surface, resulting in sparking and high temperature from overloading of the brushes and contacts. Shown: surfaces that were against commutator.

machines with commutating poles. In most cases, brush settings have been carefully marked at the factory.

Mechanical neutral is generally considered to be the midpoint of the arc between the two main pole centerlines.

Adjustment of Brush Spring Pressure

Brush spring pressure should be set at from 3 to 5 pounds per square inch for heavy metallized brushes on collector rings. A pressure of from 2½ to 3½ pounds per square inch of contact area between the brush and the commutator for light metallized and carbon or graphite brushes is proper. For heavier metallized brushes the pressure required may run higher.

The weight of the brush should be taken into account, when making an adjustment of the brush pressure. In the case of heavy metallized brushes on col-

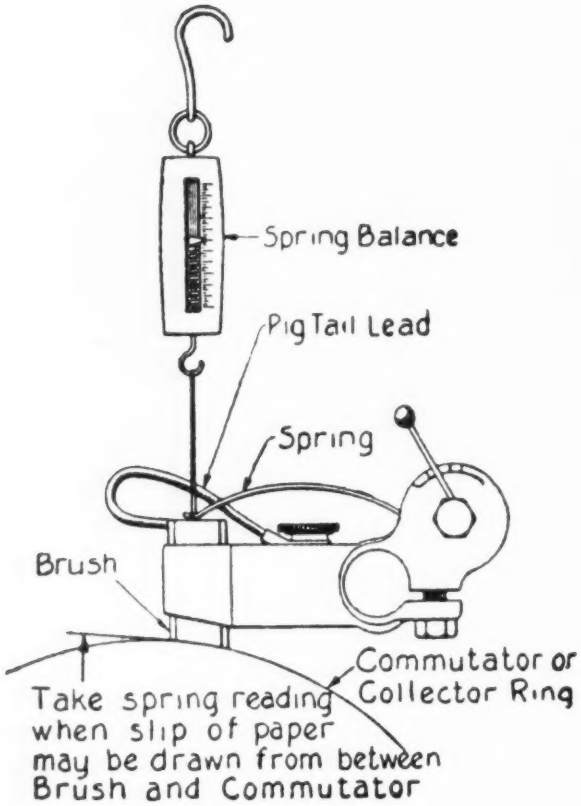


Fig. VIII—Method of obtaining brush pressure with an ordinary spring balance.

lector rings, it is usually found that a heavy brush pressure may give less brush wear and less heating than a light brush pressure.

Occasionally failure may be directly due to using too light a brush pressure. Many instances reveal heavy damage done to aluminum alloy brush holders caused by light brush pressure, effecting high brush contact resistance and high brush temperatures. The brush box actually melted on one 8000 ampere generator. The trouble was entirely eliminated after the spring pressure was increased to the proper value.

Figure VIII indicates one method of obtaining brush pressure with an ordinary spring balance. Tension on the balance is gradually increased until the paper between the brush and the commutator can easily be withdrawn. At this point the brush pressure is measured in pounds.

Installation of Brushes on DC Machines

Before installing brushes (Fig. IX), they should be carefully examined to make certain that shunts are properly secured to the holders and brushes. If these connections are defective, current will flow from the sides of the brushes into the holders and cause side burning, overheating, wear, and improper brush operation.

Brush holders should be carefully examined inside and out for burn spots, which may have been caused by arc-overs and flashing of the commutator. Brush holders should be carefully cleaned, and any roughness in the surface of the brush holder box may be removed with light sandpaper glued to a flat piece of wood.

Care should be taken that brushes, when installed, can be moved freely in the holders. They must not fit tightly. Otherwise they may stick and expand when the machine is up to temperature. On the other hand, they should not be so loose as to allow appreciable side play, leading to multiple brush fit.

Brushes should be carefully fitted to the commutator individually (Fig. X), using coarse grade sandpaper followed by fine sandpaper with the sand side turned to the brush face. After installation and fitting of brushes, the brush assembly should be carefully blown out and tension springs adjusted to the proper values.

If it becomes necessary to readjust the position of the brush supporting arms and brush holders, there are several basic fundamentals to observe.

The position of the brushes around the commutator must be carefully spaced, and the angle of the brush must be properly set. First, the distance of the brush holder stud from the commutator must be carefully measured in order to make certain that the brush holder has the proper angle. The brush holder is then checked to make certain that it is approximately equidistant from the commutator. This is usually within the range 3/32 to 5/32 inches for all ratings. The proximity of the brush box to the commutator holds the brush firmly in place, preventing chattering.

Brush holders must be in position with brushes

Fig. IX—(Left) Make sure that the shunts are properly secured to the brushes and holders. If the connections of the shunts are defective, current will flow from the sides of the brushes into the holders and cause side burning, wear, overheating, and improper brush operation. (Center) When installing the brushes make sure that they can move freely in the holders. They should not be so loose that there is any appreciable side play; on the other hand, they must not fit so tight that they may expand and stick at the operating temperatures. (Right) Fit the brushes to the commutator one at a time with a strip of sandpaper, first using a coarse grade and then a fine one, with the sand side turned to the brush face. Then, again thoroughly clean the brushes and holders, and adjust tension springs to about 2 lb. per inch to hold the brushes on the commutator.

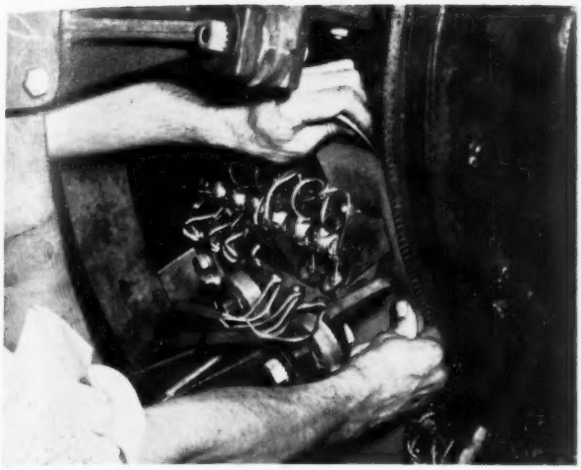


Fig. X—Fitting the brushes.

of the same polarity staggered (Fig. XI). This distributes brush wear across the commutator, as the direction of current flow from brush to commutator or vice versa has a bearing on the actual surface wear of the commutator.

In order to gauge the distance of the brush holder from the commutator, a strip of fibre may be used. With set screws or clamping bolts unloosened, the holder can be moved down until it rests firmly on the fibre, and then screws and bolts firmly fixed in place. The proper angle of the brush holder box can, in many cases, bet set by noting the angle of the wearing face of a worn brush, and using this to set the first brush holder box in place. The remaining brush holder boxes can be set by comparing to the first unit.

Proper brush spacing around the commutator can be obtained by taking a strip of paper the same length as the circumference of the commutator (Fig. XII), and marking it off into equal portions corresponding to the number of brush holder arms.

After the brush spacing has been measured, brushes should be fitted to the commutator with medium sandpaper. Double-type brush holders have angles of approximately 10 and 30 degrees. Brushes should be fitted individually, taking the angle into account. In sanding the brushes, the sandpaper is pulled in the same direction as normal rotation of the commutator. Consecutive motions of pulling the sandpaper, lifting the brush, replacing the sandpaper in position, and repeating the process will insure a good fit. After fitting with sandpaper, brush seating stone can be used to improve the fit. Brush dust should always be blown or sucked out of the machine after fitting brushes.

After thoroughly cleaning the brushes, the brush fit should be checked. First, remove the outer brush in each group and place the marked strip of paper around the commutator again, securing its ends with scotch tape (Fig. XIII). Compare the position of the brush toes with the marks on the paper, and if brushes are not equally spaced, loosen the brush holders slightly and move them up or down carefully to give the correct spacing of the brush toe. If the brushes are too far out of location, it may be necessary to correct the stud position. After checking the outer brushes of all groups, make certain that the brush toes of the group on each arm line up in a line parallel with the edge of the commutator bars.

Commutators of Direct Current Generators

Electroplating and electrolytic generators are primarily designed around the commutator.

The commutator of a direct-current machine must carry all expected load currents and commutate the rated voltage without excessive sparking, burning of the commutator bars or brushes, and other injurious phenomena.

Basically, the commutation depends upon the proper lineup and assembly of the current collecting parts and normal satisfactory operating conditions of the equipment.

Mechanical condition of the commutating parts must be such that brushes ride freely on a commutator which is mechanically true, and must provide a contact without interruption between commutator and brushes.

If good commutation is not obtained on a machine which as been in service for some time, the following points should be noted:

1. Check the brush fit and the spring pressure.
2. Check the mechanical alignment of the brush rigging and the spacing of the brushes around the periphery of the commutator. This is very important to good commutation.
3. Check all electrical connections and make certain that these are tight.
4. Check the mechanical assembly of the brush holders and brush rigging, making certain that all bolts and screws are tight, firmly fixing brush boxes in proper alignment.
5. Make certain the brushes move freely in the holders and make certain that brush contact surfaces are not burned or roughened.
6. Make certain that pigtails are not worn and that they do not interfere with movement of the brushes.

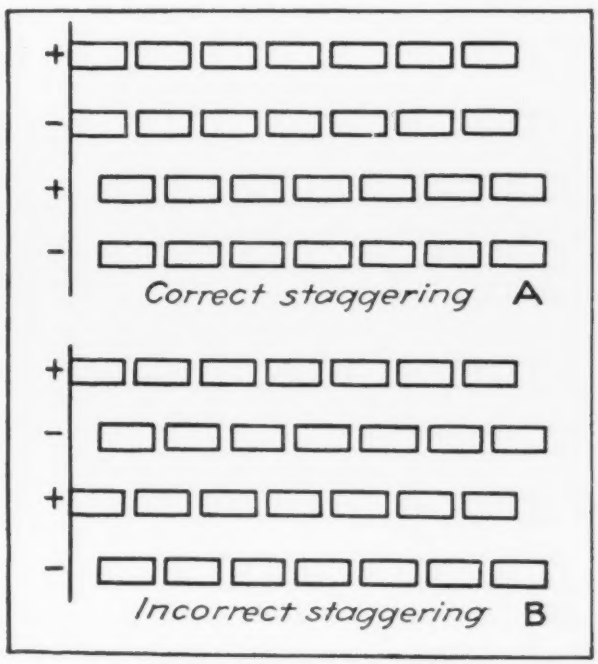


Fig. XI—How to stagger the brushholders.

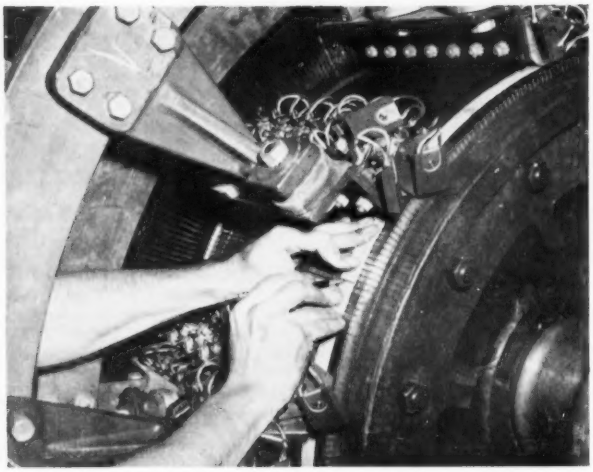


Fig. XII—Checking brush spacing.

Much of the above inspection can be done visually by the maintenance men. If this cursory check does not lead to a solution of the problem, it may be that more serious steps should be taken:

1. Make certain that the commutating field or main windings are not reversed from their normal connection.
2. Try shifting the brushes slightly from neutral. Make certain that the mechanical neutral is as required.
3. Check the surface of the commutator and wipe carefully with canvas. If the commutator is rough or eccentric, making it impossible to obtain proper brush contact, the commutator should perhaps be ground and turned.
4. Check all air gaps and make certain commutating poles are firmly in place, and properly centered between the main poles.

Under normal conditions, a copper oxide-carbon film is present on the commutator to provide good commutation. The color of this film may vary from copper to straw, chocolate to black. Gases, oil, and grease will create a mottled appearance on the commutator surface film. Fumes and oil vapors tend to smudge, gum, and discolor the commutator.

The commutator surface should at all times be clean, smooth, and have a high polished oxide film. It is therefore essential that the commutator be wiped clean with a canvas wiper at regular intervals.

In order to properly understand the complete care and maintenance of a direct-current commutator, one should carefully consider some of the ordinary difficulties which might be encountered. Firstly, the commutator must be concentric within one or two mils. The commutator bars must be at equal radial distances. In some cases the mica between commutator bars protrudes slightly, necessitating under-cutting of the mica. The mica between the bars may also become pitted due to the presence of copper and carbon dust, oil, soot, grease, and other impurities. The commutator may become grooved, because of incorrect staggering of the brushes, or using brushes with too high an abrasive content. Grooving may also be aided by lack of proper end play in the rotor.

The proper method of cleaning a commutator is to wrap a piece of dry canvas cloth or other hard non-linting material around an end of a wooden stick, which is then pressed against the commutator.

In no case should any lubricant be used on the commutator, either during or after the polishing period.

Proper dressing of the commutator includes several steps. First, the commutator is under-cut between bars. The commutator is then polished with a dressing stone, which may be hand-held or mounted in an adjustable rack. When using a polishing or dressing stone, brushes should be lifted away from the commutator and the generator should be driven by the prime mover at normal speed. (Before stoning the commutator, all dirt and grease should be removed.) After stoning, the commutator should be lightly dressed with a very fine grade of sandpaper, and then polished by using the back side of the sandpaper. After conditioning the commutator, all traces of dust, carbon, or copper should be removed by mild blowing or suction.

Brushes should then be reinstalled and seated by applying a small amount of seating compound, if available. After seating, the commutator should again be thoroughly cleaned.

If a commutator is pitted or eccentric to the extent that it cannot be easily dressed by hand, the dressing stone can be held in a pair of clamps in a tool post. Usually, however, better results can be obtained by using a revolving wheel grinder. If the commutator is exceedingly rough, it should be turned in a lathe. Unless proper facilities are available, the armature should be taken to a reputable service shop.

Collector Rings

If the motor is a synchronous machine, it will be necessary to carefully check the collector ring assembly.

Insulation resistance, from studs to rings, and from rings to shaft, should be checked at reasonable intervals to detect cracked or otherwise defective bushings and collars. Accumulation of brush dust and metal

(*Concluded on page 77*)

Fig. XIII—Checking the fit.

Laboratory Investigations on Metal Cleaning

By Samuel Spring, *Research & Development Dept., The Pennsylvania Salt Manufacturing Co.*

Samuel Spring, group leader in inorganic chemistry in The Pennsylvania Salt Mfg. Co.'s Research and Development Dept., received his bachelor of science degree from the College of the City of New York in 1936, *and his master of arts degree from Columbia University in* 1938. *After teaching chemistry at City College for two years, he became a research chemist and group leader in the Industrial Chemistry Section of Frankford Arsenal, Philadelphia, from* 1940 *to* 1947. *He then joined Pennsalt.*

A member of the American Chemical Society and Phi Beta Kappa, Mr. Spring has written and published more than a dozen articles on metal drawing lubrication and metal cleaning.

BECAUSE laboratory investigations on metal cleaning can be made under such an endless variety of specific conditions, it is necessary that work of this sort be carried on at the same time as investigation of the more practical aspects of metal cleaning. In this way it is possible to select conditions under which laboratory experimentation is carried on to fit the larger number of actual operating conditions. By comparing the results obtained in the laboratory with the observations available on shop performance, it is also possible to determine which of the laboratory methods have greater justification, so that these may then be used for further studies in which it is difficult to obtain good observations under practical conditions.

The information that will be presented here has been obtained with the above mentioned thoughts in mind. While it is not possible in advance to determine which piece of information will be useful in the solution of a practical cleaning problem, it has been very gratifying to note the number of times that information obtained in the laboratory has been useful in solving practical cleaning problems and has resulted in considerable improvement in efficiency of cleaning practices.

Our interest in metal cleaning involves attempts to answer three questions: namely, *why* does cleaning take place, *how* does cleaning take place, and *how can we get* cleaning to take place? While some attempts have been made to answer the first question, the mechanism of cleaning, our knowledge of why cleaning takes place is so small and so difficult to express, because it is based on isolated bits of information, that it would be well to skip that very difficult phase of the subject right off. It is a little simpler to provide some information as to *how* cleaning takes place or, in other words, the process of metal cleaning, if we select certain arbitrary and possibly simplified conditions to study initially. We have attempted to investigate this for the condition in which oil is removed from metal surfaces, and are fortunate in having some photographs of many of the observations which we made. While this represents a somewhat simplified condition, because many of the soils that are met with contain both oils and solid particles, which represents a more difficult cleaning problem, oil removal is nevertheless an important application and represents a start on the overall problem.

The Process of Oil Removal

In the following group of photographs, cleaning operations with an alkaline silicate cleaner containing a surface-active agent were performed at room temperature with dilute solutions in order to slow up the process sufficiently for photographs to be taken. Steel panels that had been thoroughly degreased and then pickled were immersed in a mineral oil and allowed to drain until a uniform coating was obtained. They were then immersed in the above cleaning solution. The panels were photographed at actual size.

Figure 1 represents the initial condition of a panel coated with oil. Figure 2 shows the small discontinuities that occur in the oil film as well as the shrinkage and thickening of the oil film from the sides of the panel. When the oil film becomes quite thick (Figure 3), the difference in specific gravity between the oil and the cleaning solution provides a buoyant action, resulting in breaking away of oil in the form of drops that float to the surface. At the same time the process of shrinking continues, and in Figure 4 it may be seen that a considerable portion of the oil has been removed.

A certain amount of oil remains in the form of small drops or globules spread over the surface, while, in those regions in which there is still a considerable amount of oil, the process of shrinkage and thickening continues. In Figure 5 practically all of the oil that does remain is in the form of flattened globules, while in Figure 6 globules represent all of the residual oil. More detailed information as to what happens to the globules during their removal from the surface is given in a later series of photographs.

We may digress to consider Figures 7 and 8, which

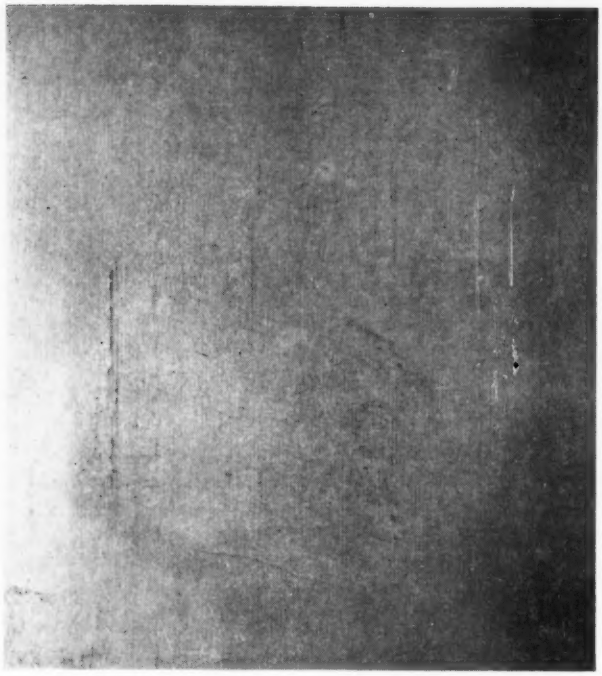


Figure 1—Initial panel coated with mineral oil.

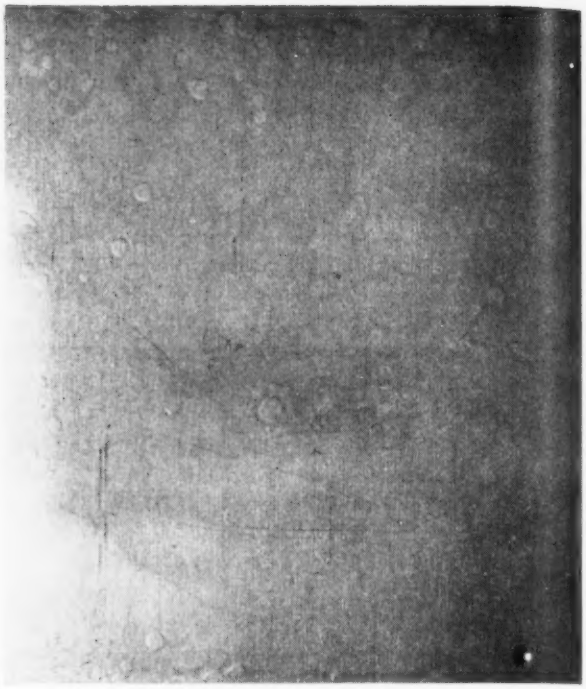


Figure 2—Shrinkage and slight thickening of oil film at edges of panel.

represent the changes that occur in the oil film when an oil covered panel is immersed in clean tap water. The process of initial shrinkage occurs, in fact much more rapidly than it occurs in some alkaline cleaning solutions, but after a short time a state is reached, represented by Figure 8, wherein no further shrinkage occurs and no further removal of oil takes place, even though the panel is kept in contact with the water for several days. Thus a basic difference between the shrinkage in water and that in alkaline cleaner lies in the *formation of globules*. It may be observed that there are no globules formed at all in Figures 7 and 8, whereas in Figures 1 to 6 some globules are formed even rather early in the cleaning process. These observations justify the cleaning procedure that is sometimes employed of presoaking in hot water, which causes the oil to go through the early stages of the shrinking process, followed by a seubsequent soak in alkaline cleaner.

A further insight into the process of oil removal from metal is obtained by examination of a profile view of the action. It is possible to do this by examination with a microscope of the removal of oil from wire by an alkaline cleaner, using about 50 diameters magni-

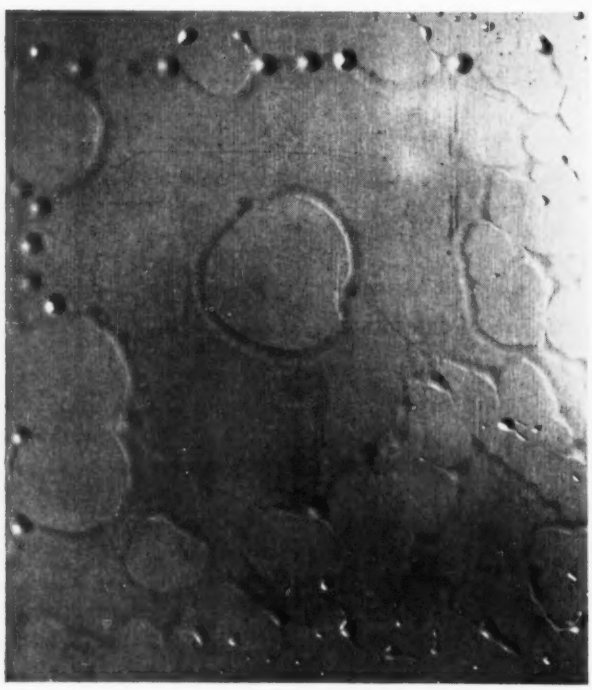


Figure 3—Initial breaking up of oil film to form drops which float to the surface.

Figure 4—Continuation of shrinkage of oil film shown in previous photo.

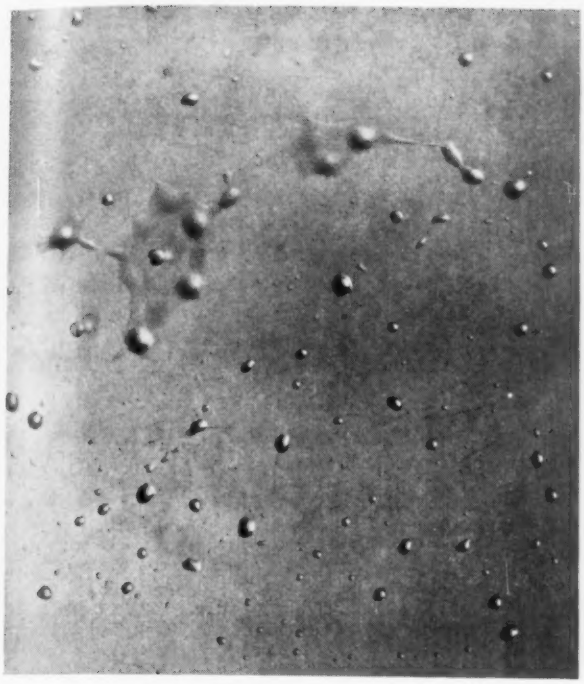


Figure 5—Shrinkage of oil film has resulted in the formation of adhering globules at this stage.

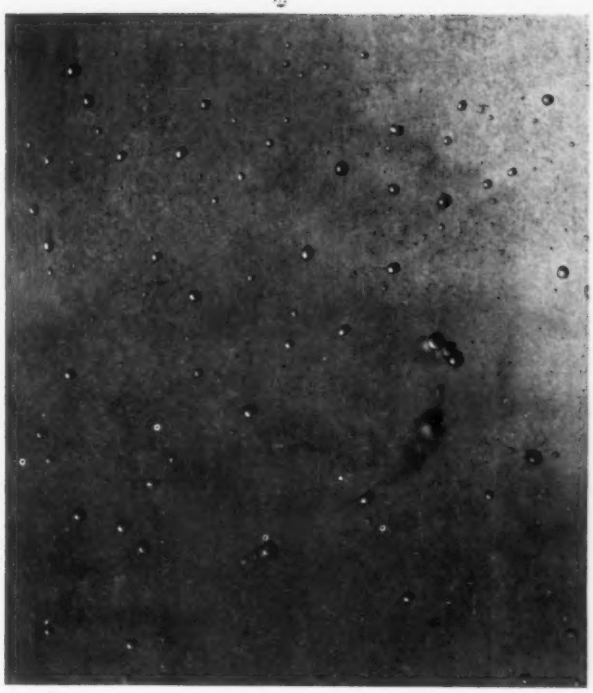


Figure 6—Final stage in the removal by shrinkage of the oil film. Note the flattened globules of oil.

fication. A few such photographs are presented in Figures 9 to 11. In Figure 9, there may be observed a later stage in the process of shrinkage and thickening of the oil film. This results in the formation of some hillocks of oil on the metal surface. As the process continues, the area of attachment of the hillock of oil to the metal becomes smaller, resulting in a globule having a flattened base (Figure 10) and representing the globule stage previously shown in Figure 6. The process of cleaning now becomes one of reducing the area of attachment of the oil globule to the metal by replacing the oil on the metal surface with the cleaning solution. This stage proceeds somewhat more slowly. Gradually the attraction of the oil for the metal is reduced by the influence of the active components in the cleaning solution, resulting in the formation of an almost spherical globule. As represented in Figure 11, this globule is attached to the metal at a relatively small area, and eventually this area is reduced to practically point contact and the globule floats freely from the surface. During the late portions of this stage, mechanical agitation is highly instrumental in displacing the oil globules from the surface and greatly facilitates the speed of the cleaning process.

It might be mentioned that the process of oil removal just described takes place not only for mineral oils but also occurs, in the same way, for fatty oils. This leads to the thought that saponification of fatty oils by alkaline cleaners is not as important a mechanism in cleaning as some people would have us believe. It is important to differentiate at this point between saponi-

Figure 7—Initial shrinkage of mineral oil film in plain water.

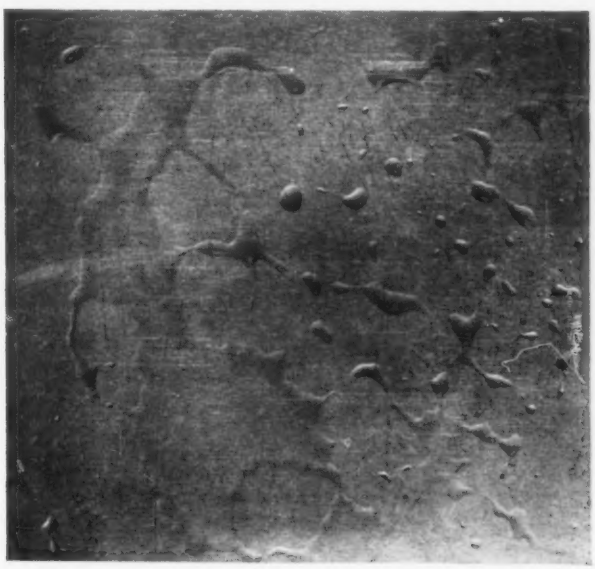


Figure 8—Final extent of oil film shrinkage in plain water.

Figure 9—Magnified view of flattened oil droplet on a metal surface.

fication as a primary factor in actual removal of the oil from the metal surface, and saponification as a secondary factor in which the soap content of the bath is built up. This soap provides a surface active agent that can function, in the process just described, in reducing the adhesion between the oil and the metal in the late globule stages. We are hoping to be able to supply some light on this question at some future time.

How to Induce Metal Cleaning

Supposing that we now concern ourselves with the third of the three questions that were posed before; namely, how can we get metal cleaning to take place? This involves a discussion of the factors involved in the removal of soil from metal surfaces. These may be listed as (1) the metal, (2) the soil, (3) the cleaner, (4) physical conditions, and (5) the rinse. We shall try to supply information on some of these factors.

Before starting this, it is recognized that it is usually the unfortunate condition confronting the man directing cleaning operations that the first two of these major factors, namely the metal and soil, must be taken as is, since they are determined outside the jurisdiction of the cleaning department. In some cases, however, it is frequently possible to make some modification of these factors. For example, we may quote from a paper in the A.E.S. Monthly Review by *F. A. Maurer*, of the General Electric Company at Ontario, Calif., thus:

> "Lubricants in the drilling, tapping, and polishing operations are carefully selected with the object of ready removal in the cleaning prior to plating."

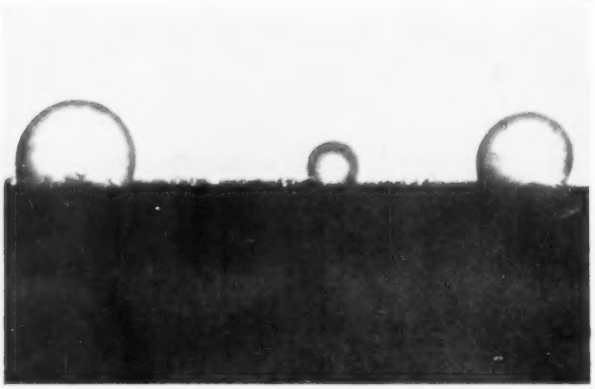


Figure 10—Globule of oil with flattened base. Second stage in oil removal.

However, information on these factors can be of value even if there is no control over the type of metal and soil, in that a certain change in cleaning performance can be traced back to a change in processing conditions, provided that we know what to look for. Let us now look at some laboratory results involving these conditions.

Experimental Method Used

Before discussing these results, I should like to describe the method that was used in obtaining these results. In general, this consists of cleaning carefully processed metal panels under conditions in which time, agitation, temperature and concentration of cleaner are carefully controlled. Uniform coatings of oils are obtained by immersion of the panels in the appropriate oil, followed by drainage of the excess

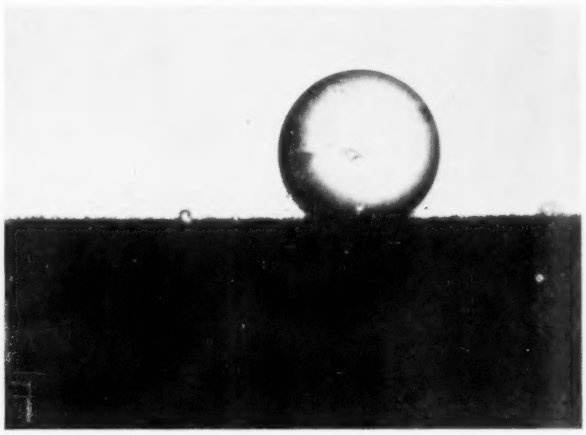


Figure 11—Nearly spherical globule of oil formed at a later stage in the cleaning operation.

oil for one hour under conditions in which the temperature is carefully kept within certain limits. A constant temperature bath is used for temperature control of the cleaner and a slow rate of agitation is obtained by rotating panels at the rate of ten revolutions per minute. They are then withdrawn from the cleaning solution and rinsed for five minutes in warm water at 50°C., utilizing good agitation. After the rinsing operation, the panels are allowed to come to room temperature in water, drained for one minute, and then sprayed with a fine mist of water. On those areas that are not clean, there is condensation of discreet droplets, whereas the cleaned areas have continuous water films. The soiled areas are sharply delineated by this process, so that they can be sketched on graph paper having one hundred squares, or on a viewing screen, following which the percentage of the panel area that has been cleaned is summed. The *Cleaning Index* used is the average value obtained for ten observations and represents the percentage of the area that is clean. As might be gathered, this represents a sensitive water break test which has been made quantitative and in which efforts have been made to avoid false water film, due to absorption of surface active agent on top of the water film, by means of an efficient warm water rinse. Changes in "water-break" area, due to variable drainage and evaporation of the water film, have been eliminated by means of this

technique. When properly set up, this method has yielded data that may be considered quite good for this type of experimentation.

The Metal Surface

Two factors that have been found to be very important in the removal of oils from metal surfaces are the presence or absence of oxide and the magnitude and type of roughness of the surface. Some results obtained in studying the effect of oxide are given in Table I.

Let us look at the first column of data in the table. It may be seen that for cold-rolled steel, which is undoubtedly covered with oxide in the as-received condition, the removal of mineral oil is quite efficient, as evidenced by a Cleaning Index of 97%. A mild pickling operation before soiling with the mineral oil has a pronounced effect in reducing this cleaning efficiency. Further pickling of the surfaces, until evidences of etching appear, causes a further reduction in efficiency of cleaning. When the pickled surface is passivated by treatment with concentrated nitric acid, which is removed by wiping prior to rinsing, a treatment that has been established as forming a tightly adherent oxide coating, values for Cleaning Index are increased, only to be lost again when the passivation is followed by a mild pickling operation.

It is interesting to contrast this behavior for mineral oil with that of a sulfurized lard oil that contains 10% free fatty acid. Here the effect of removal of oxide by pickling is the reverse of that obtained for the mineral oil, the cleaning efficiency becoming better as the oxide is removed and worse as oxide is replaced by passivation. The effect is attributable to the fatty acid content, since addition of oleic acid to bring the free fatty acid content of lard oil up to 10% causes the results to be similar to those obtained for sulfurized lard oil, while removal of the free fatty acid from sulfurized lard oil causes the results to be similar to those obtained with mineral oil. Pure lard oil, low in free fatty acid, behaves like mineral oil. Thus, for oils low in free fatty acid content, pickling of cold-rolled surfaces prior to soiling results in more difficult oil removal, whereas for oils rich in free fatty acid this pickling operation results in more efficient oil removal. The latter effect is probably connected with the elimination of the formation of metallic soaps, which can form by reaction between the metallic oxide and the fatty acid; the metallic soaps serving to anchor the soil.

TABLE I

Oxide Effect on Steel

Surface Treatment	Medium Mineral Oil	Prime Lard Oil	Sulfurized Lard Oil 10% FFA	Lard Oil +8% Oleic Acid	Sulfurized lard oil (free fatty acid removed)
	Cleaning Index				
1. Cold rolled	97%	87%	20%	78%	53%
2. Pickled	47	50	55	92	9
3. Acid etched	17	8	39	..	..
4. Pickled & treated with concentrated nitric acid	85		17	..	..
5. Same as 4 then pickled	36		23	..	..

TABLE II

Effect of Roughness of Metal Surface

Surface Treatment	RMS Value	Cleaning Index Unpickled	Pickled
Smooth rolled	6	86	44
Medium smooth rolled	19	88	47
Rough rolled	31	97	47
Ground, fine wheel	—	83	50
Ground, medium wheel	—	62	—
Ground, coarse wheel	—	56	47
Shapered	—	30	12
Sandblasted lightly	—	14	16

Effect of Surface Roughness

A number of steel panels were found, all of which had been cold-rolled, but which differed to a considerable extent in surface roughness. These were compared to determine the effect of this type of roughness on oil removal. An estimate of the roughness of these surfaces can be obtained from the root mean square value obtained with a Brush surface analyzer, and it may be seen in Column 1 of Table II that there is considerable difference among these values. However, the values for cleaning efficiency were similar for all of these three conditions, indicating that only certain types of roughness cause differences in cleaning. Steel surfaces that were ground with a fine, medium and coarse grinding wheel yielded values for cleaning efficiency that became less as the coarseness of the wheel increased, for the unpickled condition, although the values were the same for the pickled condition. Further increase in roughness, as by using surfaces prepared with a shaper, using a fine feed, or by light sandblasting, caused oil removal to become increasingly difficult. It is interesting that for the rough surfaces the effect of pickling and passivation is considerably less than in the other cases. Recalling the process of metal cleaning described before, it appears that past a certain level of roughness the normal tendency of the oil film to shrink and form globules is interfered with by the rough surface.

Effect of Oil Composition

Viscosity

Some information on the effffect of viscosity of mineral oils on the ease of their removal is presented in the curve, Figure 12. It may be observed that the efficiency of mineral oil removal drops off fairly rapidly as the viscosity of the oil is increased.

It has recently been suggested that in emulsion cleaning one possible mechanism is reduction of the viscosity of the oil by solution of some of the solvent in the soil. This may or may not be the case. In all probability, one of the important effects of temperature in the cleaning process is in determining the viscosity of oil-type soils.

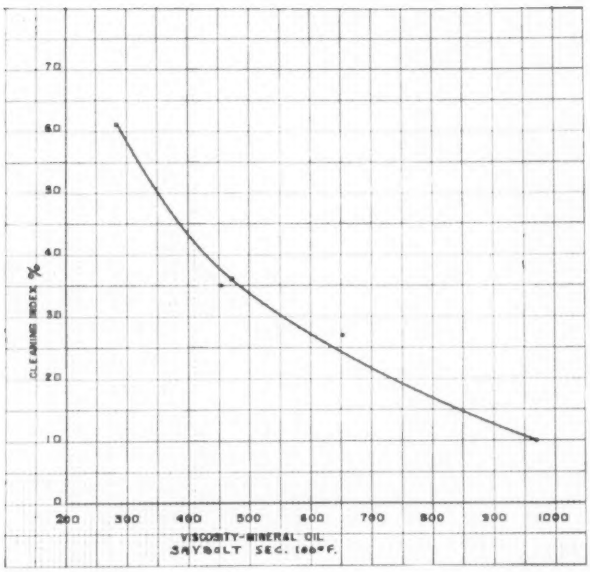


Figure 12—Relation of viscosity of mineral oil to the Cleaning Index.

Free Fatty Acid

The effect of free fatty acid content of a typical fatty oil on its cleaning is given in Table III.

It may be observed that removal of the bulk of the free fatty acid normally present in lard oil causes a sharp reduction in the efficiency of cleaning. This is restored on restoration of the original concentration of free oleic acid. Also, the removal from metal of a lower grade lard oil that is richer in free fatty acid, or use of the higher grade lard oil enriched with oleic acid, is considerably easier for the pickled condition, although there is a small drop off in efficiency for the unpickled steel condition because of the oxide effect described before.

It is believed that this is significant information. Practically all vegetable and animal oils and fats have a certain amount of free fatty acid, depending upon the conditions under which they have been refined and stored prior to use. Lower grades of fats and oils usually have higher free fatty acid contents, which is

TABLE III

Effect of Free Fatty Acid Content in Removal of Lard Oil from Steel

Oil	% Free Fatty Acid	Source of Free Fatty Acid	Cleaning Index Pickled Steel	Cleaning Index Unpickled Steel
Lard (Prime)	0.1%	Free Fatty Acid removed from Lard Oil with NaOH	20%	30%
Lard (Prime)	1.8%	As received	44%	88%
Lard (Prime)	1.8%	Oleic Acid added to Lard Oil minus Free Fatty Acid	47%	92%
Lard (Prime)	2.8%	1% Oleic Acid added to Prime Lard Oil	86%	
Lard (No. 2)	4.1%	As received	81%	83%
Lard (Prime)	10.0%	8% Oleic Acid added to Prime Lard Oil	92%	78%

TABLE IV

Comparison of Ease of Removal of Oils of Various Compositions (Viscosity of Oils Equivalent)

Oil	% Free Fatty Acid	Cleaning Index Pickled Steel	Cleaning Index Unpickled Steel
Lard (prime)	0.1%	20%	30%
Mineral	0%	56%	94%
Sulfurized fatty in Mineral	0.1%	0%	47%
Sulfurized Mineral	0%	38%	81%

not adverse insofar as cleaning is concerned, as these data indicate, unless the free fatty acid content becomes abnormally high. In this case oil removal may actually be more difficult for unpickled steel.

The effect of addition of fatty acid to *mineral oil* on cleaning efficiency may also be discussed briefly. The addition of free fatty acid to *mineral oil* causes a sharp improvement in cleaning efficiency except where the level of cleaning efficiency is high initially, in which case there is little change. For unpickled surfaces, the level of cleaning is so high that the oxide effect due to the presence of a high concentration of fatty acid is not observed.

Because of the widespread occurrence of free fatty acid in metal working and polishing lubricants, this free fatty acid effect is of considerable importance. A little while ago we discussed the probability that saponification of fats and oils is not the most important primary effect in metal cleaning. On the other hand, the interaction between the free fatty acid present in fats and oils and other lubricants is very important in determining the removal of these oils. Whether this is due to the rapid formation of soaps by interaction of the alkali in the cleaner and the fatty acid in the oil, or whether it is due to rapid alteration of interfacial tensions during the course of reaction to form soap right at the seat of adherence of the oil to the metal, has not as yet been established. It is interesting, however, to observe an experiment in which the interaction of single drops of oil and cleaner on metal surfaces are observed. If a drop of mineral oil is allowed to spread on a steel surface, particularly one that has been pickled, and a drop of an alkali in solution is placed next to it, there will be a point at which the two drops meet. Normally, under this condition the oil tends to flow toward the alkaline solution without much displacement of the oil drop. On the other hand, if the drop of mineral oil has in it a moderate proportion, for example, 3 or 4%, of free fatty acid, there is a marked difference in behavior. At the point at which the oil and alkaline solution come together there is a violent interaction which results in displacement of the oil from the metal by the alkaline solution and by breaking of the oil into a number of small droplets as a result of this violent interaction. Subsequently, the solution becomes

(*Concluded on page 74*)

Some Notes on the Electroplating of Powder Metallurgy Parts

By Dr. Henry H. Hausner, *Sylvania Elec. Prod. Co., New York, N. Y.*

THE same reasons that often make it desirable, or necessary, to electroplate metal castings, also pertain to the products of powder metallurgy. However, because of the porosity occurring in most sintered compacts, it is hardly possible to make use of the same plating techniques that have been used successfully with ordinary metal components. The porosity of powder metallurgy products has two effects on the plating process. First, and usually of minor importance, is the surface porosity which makes it rather difficult to produce a continuous non-porous finish. Second, and more troublesome, is the strong capillary attraction exerted upon the electrolyte by the large surface area of the interconnected interior pores. This latter phenomenon makes it very difficult to remove the electrolyte from the interconnected internal pores by the usual rinsing or cleaning methods and ordinarily leads to discoloration, a high rate of corrosion, and some other troublesome phenomena.

The effect of porosity can be compensated to a certain extent by repressing or rolling, or by some other types of cold-working. It happens that products with a density of approximately 90% of their "theoretical" density, when heavily worked, display a non-porous surface layer which is amenable to plating. If the density of the sintered product is 96% or more of the theoretical density of the material, the compacts can usually be considered as having only isolated pores which hardly affect the plating process.[4] However, this process of closing the surface pores applies only to ductile metals.

Surface pores greatly increase the surface areas, and increased surface porosity therefore requires increased current density in order to obtain efficiency in the plating process, whether the electrolyte is acidic or alkaline. Alkaline electrolytes usually require less current density than acids, but balancing this advantage of alkaline electrolyte is the high concentration of hydroxyl ions remaining within the pores after the plating operation. Carbon dioxide from the air diffuses inward and reacts to form carbonates which have a greater molar volume than the corresponding hydroxides, causing them to flow outward and spoil the surface. This is the phenomenon known as "flowering" which causes most of the trouble when porous parts are plated.

P. Schwarzkopf[6] has suggested that holes and pores of sintered ferrous products be closed by impregnation with molten metals, such as Pb, Cu, and Sn. Such treatment increases not only density, and static as well as dynamic strength (by elimination of the notch effect of pores), but also corrosion resistance. This treatment could also be useful as a preliminary to electroplating, since it facilitates the deposition of continuous and adherent layers and prevents corrosion due to penetration of the electrolyte into the pores of the compact. The use of waxlike substances as impregnating material applied prior to electroplating has also been suggested, but because of its unfavorable effect on the adherence of the deposits it is considered less advisable than metallic impregnation.

Changes in the plating methods are frequently proposed for the treatment of powder metallurgy products. *G. L. Bonanno*[1] recently described such a method for electroplating toy locomotive wheels. The toy industry uses many powder metallurgy parts, and the well known Lionel toy locomotive uses not less than 44 parts made by powder metallurgy methods. These wheels are ordinarily black oxidized, but where very low contact resistance is essential, as in radio frequency controlled trains, they are nickel plated through the use of a proprietary method of plating. In this method, the troublesome residual salts, which formerly had to be leached out by repeated washings, are volatilized by an annealing process. Salts which are not volatilized at the annealing temperatures are first converted to volatile salts by chemical treatment.

Another method to avoid the troublesome effect of interconnecting pores consists in the coverage of exterior and interior surfaces with a very thin film of non-metallic water-repellent protective that allows only sufficient penetration of the ions to form the electrodeposit on the surface of the parts.[4] The following process has been developed for use on porous iron, but there seems to be no reason why it could not be used successfully for non-ferrous compacts:

1) Heat the compact in air to 400°F.
2) Quench in a solution of Dow-Corning No. 200 Silicone (350 centistokes at 250°C.) with 96% carbon tetrachloride or perchloroethylene.
3) Remove compacts, dry and bake at 400°F. for one-half hour.
4) Pickle in proper type of solution for base metal.
5) Cold water wash.
6) Use usual plating procedure.
7) Cold water wash.
8) Dry and inspect.

It must be remembered that caustic cleaners are not suitable for step 4 in the above mentioned process and the pickling time should be kept to a minimum after the proper surface has been obtained for plating. Although the compacts may appear greasy after the pickling, they are clean enough to plate. This process will not cause pore "bulging," and if corrosion protection is wanted, the parts should be heated above 100°C. in air or atmosphere and quenched in a good inhibiting solution.

An interesting solution of electroplating powder metallurgy articles was recently described in a British patent application.[2] When porous compacts are to be electroplated it is essential to remove any residual salts from the plating process. Acording to the British patent application, this can be done by electroplating the pressed (green) compact and by sintering the compact afterwards. The compact may sometimes require a presintering treatment (sintering at low temperature)[5] before electroplating in order to have greater strength. When a cyanide bath has been used, it may be advisable in some cases to treat the plated compact with oxalic acid or dilute sulphuric acid to obtain more easily volatilisable salts and thus reduce the time required for the heat treatment. Another feature of the process is that two or more coatings may be applied which will alloy during the subsequent sintering or heat treatment. The examples in this patent application quote the nickel-plating of green pressings of 99% iron, 1% graphite, which were sintered in hydrogen for 30 min. to 1100°C., held at temperature for 1 hour, and cooled. The coating partly diffused into the porous compact, and did not peel even with coining at 50 tons/in.² Such specimens had greatly superior corrosion resistance to those plated without subsequent sintering or heat treatment. A green pressing made as above was given a nickel coating 0.001 in. thick and then a copper coating 0.0005 in. thick. After sintering the coating had the appearance and the composition of Monel metal.

Another British patent application[3] described the production of plated bearings. Iron (98% iron, 1% graphite, 1% calcium stearate) and iron-copper (73% iron, 25% copper, 1% graphite, 1% calcium stearate) bearings are silver-plated by the above described process. The plated coating may consist also of any of the usual bearing metals or alloys, e.g. lead, antimony, tin, cadmium, silver-indium, aluminum-tin, nickel-tin, and the base material may also be bronze.

In conclusion, there are at present four developments which show promise for electroplating powder metallurgy parts:

1) To close surface pores and to avoid interconnecting pores;
2) Certain changes in the plating technique;
3) Coverage of exterior and interior surfaces with water-repellent protectives;
4) Plating of green compacts.

Future development will reveal which of these four methods will be the most effective one.

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LABORATORY INVESTIGATIONS OF METAL CLEANING

(*Concluded from page 72*)

turbid as the less soluble soap is formed from the fatty acid and the alkali. It is suspected that the soap formation is a secondary effect.

Many of the differences among cleaners insofar as both alkali and surface active agent are concerned are obscured when the oil being removed is rich in free fatty acid because of the prominence of this effect of interaction between fatty acid and alkali. This does not necessarily mean that the weaker alkaline salts are as good as the strongly alkaline salts, because the alkaline reserve available in the cleaner will determine the effective life of the cleaning bath and, in addition, this effect is only one of a number of factors that determine the efficiency of metal cleaning.

It is of interest to compare a group of representative oils which have been adjusted to have approximately the same viscosity and the same free fatty acid content, insofar as the latter is posssible, to see the effect of the normal components of the oils in themselves. This is presented in Table IV. It may be observed that this group of oils forms a series, going from the more easily removed to the less easily removed oil, of mineral oil, sulfurized mineral oil, lard oil, and sulfurized fatty oil.

This article has presented some information of a more general nature deduced from laboratory experimentation. This has been carried up to the point of discussing the cleaner itself, which will be the subject of another article.

The Use of Glycerine in Electropolishing

By Milton A. Lesser

THE important role of glycerine in electrolytic polishing has been generally recognized by the students of this process since *H. H. Uhlig* published his report on the polishing of 18/8 stainless steel in 1940[1]. Uhlig found that optimum results were obtained with the following electrolyte:

Phosphoric acid	42 per cent
Glycerine	47 " "
Water	11 " "

This was used at a temperature of 100°C. or higher with an anode current density of at least 0.1 ampere per square inch.

Glycerine now finds use in the three main phases of electrolytic polishing, including the laboratory preparation of metallographic sections, the industrial polishing of a number of metals and their alloys, and the more recent type of treatment which may be called electrosmoothing or electromachining.

In recent review by *Jacquet*[2], this well known pioneer and leading authority in the field points out that although there is now quite a large number of laboratory and shop processes for polishing common metals and alloys, the basic constituents of the electrolytes are limited to a few chemical products. Glycerine is included among these basic chemical materials.

Electropolishing is usually thought of as the reverse of electroplating. In electroplating the work is made the cathode and metal is added, while in electropolishing the work is made the anode and metal is removed. The amount of metal removed in an electropolishing procedure depends upon the time of immersion, temperature conditions, the current density and, to some extent, upon the condition of the surface.

As noted by *Faust*[3], electropolishing attains metal surfacing without mechanical work being done on the metal. In addition to producing surface brilliance and color not possible by wheel polishing, buffing or tumbling, electropolishing produces other benefits as well. These benefits, it has been pointed out, are due to the fact that electropolishing is free of the undesired effects of mechanical work, such as heat effects, strains, and tearing and deranging of the crystal structure of the surface layers. Moreover, as remarked by *Lang*[4], electrolytic polishing usually results in a surface which is highly passive and which is much less susceptible to atmospheric and chemical corrosion than a surface polished by other means.

Electropolishing, with its ability to get into corners, crevices and recesses of intricate forms, often provides the answer to the problem of polishing irregularly-shaped articles. In general, says *Wernick*[5] the more curved the surface the more readily is it adaptable to electropolishing methods.

Phosphoric Acid Baths

The mechanism by which glycerine produces its beneficial effects has not been fully elucidated. According to Wernick, it is believed that the glycerine forms a complex with the phosphoric acid which is less conductive than the phosphoric acid alone. It is possible that metal compounds formed from this complex may produce an anodic film that is more efficient in its polishing or smoothing action than the acid alone. In his opinion, the effect of the glycerine addition must obviously make itself apparent at the anode interface and is very reminiscent of the effects of addition agents which are normally employed in plating practice in order to reduce grain size or to achieve a higer degree of luster on electrodeposits produced at the cathode.

Like Uhlig, he notes that a further useful effect of the glycerine is that it inhibits direct attack of the electrolyte on the anode surface, such as would occur normally through reaction with the acid constituent. This is particularly important in view of the high temperature at which the process of polishing stainless steel is carried out.

Others have confirmed the superiority of the phosphoric acid-glycerine bath for the electropolishing of stainless steel. For example, work at the research laboratories of the *Glycerine Producers' Association* affirmed the effectiveness of glycerine in preventing etching of the metal surface. This work also put emphasis on the need for adequate preparation because it was found that the better the original surface the better the results.

In experimental work carried out by Wernick, comparisons were made between the phosphoric acid-glycerine bath and a sulfuric acid-citric acid bath. He found that the phosphoric acid-based electrolyte produced a consistently superior degre of polish over that based on sulfuric acid.

Particularly indicative are the more recent series of comparisons of various electrolytes made in England by *Evans and Lloyd*[6]. In their studies, electrolytic polishing tests were carried out on stainless steel and nickel silver teaspoons; the nickel content of the latter varying from 12 to 22 per cent. Most promising results were obtained with an aqueous phosphoric acid solution. When the phosphoric acid of this solution was progressively replaced by glycerine, the reflectivity of the polished surface increased but the area which could be polishd was reduced. The best surface finish was obtained with an electrolyte containing:

Orthophosphoric acid	37 per cent
Glycerine	56 " "
Water	7 " "

It is evident that this solution is somewhat similar to that developed by Uhlig. In the case of stainless steel spoons, the English workers found that a good polish was obtained with a solution temperature of 100° to 120° C. Although a wide range of current densities could be used, optimum results were obtained at a current density of 5 to 10 ampers per square inch. In the case of nickel silvers containing 12, 15 and 22 per cent nickel, an operating temperature of 50° to 70°

C. was found to give the best results. A current density of 1 ampere per square inch gave optimum effects on nickel silver spoons.

Sulfuric Acid Baths

It must not be assumed, however, that the value of glycerine in the electropolishing of steels is limited to its use in conjunction with phosphoric acid. Baths based on or containing sulfuric acid have also employed glycerine as an addition agent. This is evident in the typical formulas presented in Lang's discussion of the electrolytic polishing of metal. Thus, an electrolyte for use with stainless steel is given as consisting of:

Sulfuric acid	50 per cent
Glycerine	40 " "
Water	10 " "

This is used at a temperature of 90° to 200° F., at a current density of 300 to 1,000 amperes per square foot, for from three to nine minutes.

Lang also cites an interesting electrolyte for use in polishing 18 per cent chromium steel. Containing both phosphoric and sulfuric acids, and to be used at a current density of 1,000 amperes per square foot, this electrolyte is made from:

Sulfuric acid	16 per cent
Phosphoric acid	13 " "
Glycerine	56 " "
Water	15 " "

He likewise includes the following electrolyte for use in the electropolishing of nickel and nickel silver:

Sulfuric acid	33 per cent
Glycerine	33 " "
Water	34 " "

This is employed at a temperature of 96° F., with a current density of 1,000 to 2,000 amperes per square foot, for ten seconds.

This last brings to mind the electrolytes developed by *Faust*[7] for electropolishing German silver or iron or nickel or their alloys. Suitable solutions are made from:

Sulfuric acid	33-50 per cent
Glycerine	33-40 " "
Water, to make	100 " "

From the foregoing it is evident that the benefits of glycerine extend to baths for the electropolishing of a variety of metals. Uhlig, for example, mentioned that solutions similar to his phosphoric acid-glycerine bath could also be used to polish nickel, copper, chromium steels, 18/8 containing molybdenum and mild steel similar to 18/8. Jacquet also cited the use of aqueous phosphoric acid in alcohol or glycerine for polishing copper, brass, zinc, cadmium, stainless steel, magnesium and cobalt. The work of Evans and Lloyd showed that, in addition to stainless steel and nickel silver, such metals as nickel, Inconel, copper and 70/30 brass can be electropolished satisfactorily in their phosphoric acid-glycerine-water solution. Walton's investigations, reported at the 115th meeting of the American Chemical Society March 1949, are significant in that they also indicate the efficacy of phosphoric acid-glycerine electrolytes for polishing copper. His findings will be published on completion of the investigations[8].

Electropolishing Light Metals

Other types of baths have also made good use of glycerine, especially those for polishing the lighter metals. Glycerine, of course, has found many uses in various anodic treatments for aluminum and the development of electropolishing processes has extended this utility[9]. For example, *Mathers* and *Ricks*[10] reported that aluminum was successfully polished in a bath containing 12 cc. of concentrated sulfuric acid and 24 cc. of glycerine. This was electrolyzed at 0.25 amperes per square inch for 20 minutes. In the so-called Battelle process for electropolishing aluminum to increase its reflectivity, the active bath consists of a mixture sulfuric and phosphoric acids. A small proportion of glycerine is added to this bath to act as a buffer[11].

Also indicative is *Tosterud's*[12] process for brightening the surfaces of aluminum and aluminum alloy products. Thus, in a typical example from his patent, aluminum castings containing 5 per cent of silicon may be brightened by anodic treatment in a bath consisting of:

Hydrofluoric acid	13 per cent
Glycerine	52 " "
Water	35 " "

The object is anodized in this bath for ten minutes with a current density of 1.5 amperes per square inch at a temperature of 77° F.

Magnesium and its alloys may also be polished by anodic methods. A British patent[13] describing such a process lists among the suitable electrolytic baths various solutions consisting of hydrochloric acid or perchloric acid in glycerine.

Electromachining and Special Operations

In addition to its use in creating bright finishes on metals, Faust points out that electropolishing is replacing mechanical equipment for machining parts to size, for removing burrs from stamped, ground, punched or other machined edges and for getting surfaces ready for final finishes. Sometimes electropolishing can take off burrs from the stamped edges of complicated shapes and from inaccessible areas more readily than mechanical removal.

Glycerine-containing electrolytes have found application in this somewhat newer phase of metal treatment which might well be called electromachining, electrodeburring or the like. For instance, with their phosphoric acid-glycerine-water solution, Evans and Lloyd have used the electrolytic technique for removing the burrs at the edges of holes in pressings.

Rather specifically designed for the purpose is the electrolyte developed by *Edmondson*[14] for simultaneously brightening and smoothing metal surfaces. The electrolyte, which consists of 25 per cent of commercial hydrochloric acid and 75 per cent of glycerine may be used for electrolytically removing burrs and machine marks, for smoothing metal objects to certain size specifications, for symmetrically removing surface metal from ordinarily inaccessible parts and for a variety of other purposes. The required amperage will vary somewhat according to the results desired and the metal being treated. The solution, which is used

at room temperature, is applicable for the electrolytic treatment of stainless steel, aluminum, brass, copper and various ferrous metals, including iron. A unique feature of the hydrochloric acid-glycerine bath is the fact that it can be rejuvenated by adding up to 10 per cent of acetone.

In the metallurgical laboratory, glycerine-containing electrolytes have also proved useful for the electropolishing of specimens. Jacquet mentions that the electrolytes which allow the polishing of very small surfaces in the laboratory are based on low concentrations of perchloric acid in ethyl or methyl alcohol, with the occasional addition of glycerine. In discussing the electrolytic polishing of bronzes with respect to photomicrographic applications, he further suggests[15] that faster action can be obtained with an electrolyte consisting of:

Phosphoric acid (sp.gr. 1.71)	420 cc.
Glycerine	80 cc.

A novel use of glycerine is apparent in an improved solution for electropolishing aluminum alloy specimens. As developed by *Hauffe and Tillig*[16], the fluid is employed to reduce the fire hazard of the alcoholic electrolytes which had been used for polishing the samples. For example, such a solution could be made from:

Alcohol	97 cc.
Glycerine	97 cc.
Ether	6 cc.
Perchloric acid (1.12 Gm. per cc.)	50 cc.

In another European report[17] on the electrolytic polishing of metallographic sections, it is stated that satisfactory results with steel were obtained by using mixtures of sulfuric and phosphoric acid with various additions, including glycerine. A combination of this kind is as follows:

Phosphoric acid	51.0 parts
Sulfuric acid	12.0 "
Water	6.5 "
Glycerine	24.0 "

Such a solution will etch stainless, acid-resistant and high-speed steel at room temp. and polish it when hot.

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ELECTROPLATING GENERATORS

(*Concluded from page* 66)

dust will tend to reduce the dielectric and increase leakage.

Collector rings may be washed with carbon tetrachloride, and care of brushes and brush holders is similar to that required for the equivalent portions of the direct current machine.

Under normal conditions the collector rings should have very little wear. Proper end play and brush staggering normally minimizes the wearing of the rings. If the rings become worn or pitted, the faces should be machined, preferably in a lathe, or machined with a portable tool.

Bearings

Many electro-plating or finishing motor-generators are of sleeve bearing construction.

The quickest method of checking on bearing wear is a measure of concentricity of air gaps. This is usually done with a tapered air-gap gauge. Air gaps under like poles should be within 10 per cent.

If it becomes necessary to remove a sleeve bearing lining, the following procedure may be used (applicable to the average machine):

(1) Remove the oil well cover plate.

(2) Remove the clip over the oil ring.

(3) It is then usually possible to remove the bearing lining.

In removing the bearing lining, it is sometimes necessary to use a short length of round bar or pipe bearing against a disc, covering the outer diameter of the bearing shell. Always try to place strain on the bearing race which is resisting motion, wherever possible.

In replacing the sleeve bearing, it should be gently pressed into place, making certain that the bearing is properly located with respect to the lubricating system, and that the oil ways and housing are absolutely clean. Make certain that the oil slingers and retainers are in place, and if ring oilers are used, make certain that the rings are in place and have free play.

There is no substitute for the experience of a good plant maintenance supervisor. Many things can best be learned the hard way. However, it is hoped that this discussion will help to minimize the errors made, and reduce the maintenance expense which can be such a large factor in plant operations.

There are perhaps two final words of emphasis. We cannot overstress the value of good housekeeping. Like a surgeon completing an operation, a workman completing operations on or near a capital electrical equipment should "count his tools". The machine and area should be left clean and free of parts or other loose objects.

All employees should have an accurate idea as to the importance of the electrical equipments to the plant operation and their own welfare, and the actual capital investment involved. They should be alert to do their part to make certain that the electrical equipments are given a chance to perform their duty without danger of failure due to carelessness or neglect.

New Abrasive Methods Cut Costs

By Stan L. Johnson *

NEW economies in metal finishing, economies running into thousands of dollars annually, have been achieved through the development of new mechanical equipment for the use of coated abrasive belts, with the result that a number of new methods for preparing metals are now available to industry.

Two of these new methods are:

Pre-Finishing—A method of grinding and finishing any type of flat metal, sheets, bars, or strips, prior to forming in order to eliminate costly hand polishing after forming.

Contour Grinding and Finishing Equipment—A method in which a specially contoured back-up roll enables the abrasive belt to conform to the contours of a formed metal product; the metal product being fed automatically against the belt.

Prefinishing

Of these developments, "pre-finishing" is perhaps the more remarkable, although formed rolls and automatics also offer exceptional economies.

"Pre-finishing" employs one to a dozen or more abrasive belt machines, arranged in a tandem line-up. Flat metal stock moves through a progression of grits from coarse to fine, and comes out polished. It is then automatically given a thin plastic coating to protect it against die-marks and handling marks. After forming, the coating is peeled off, air-blasted off or dissolved in water, and the pre-finished formed metal is then ready for plating, enameling, lacquering or painting—and costly hand-finishing after forming has been eliminated.

The following advantages seem probable, according to manufacturers, suppliers and fabricators who are already either using or studying the method:

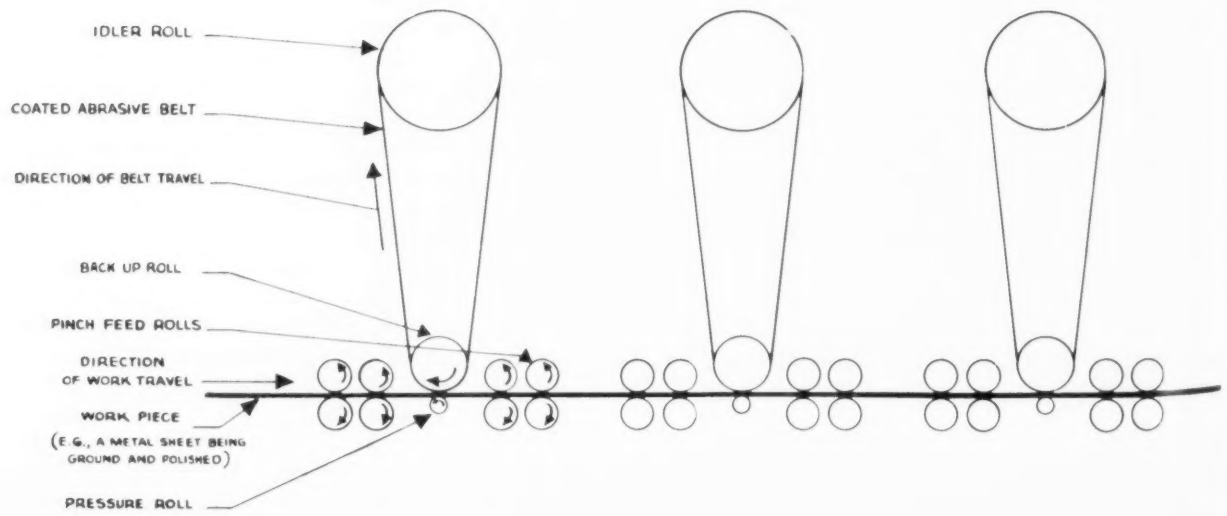
1. The opportunity to use lower commercial grades of steel mill finishes.
2. Lower unit costs with increased plant capacity.
3. Fewer rejects.
4. Longer life of dies.
5. Ground and finished metal presents a better surface condition for plated, lacquered or enameled finishes, with a resultant higher luster and greater eye appeal.

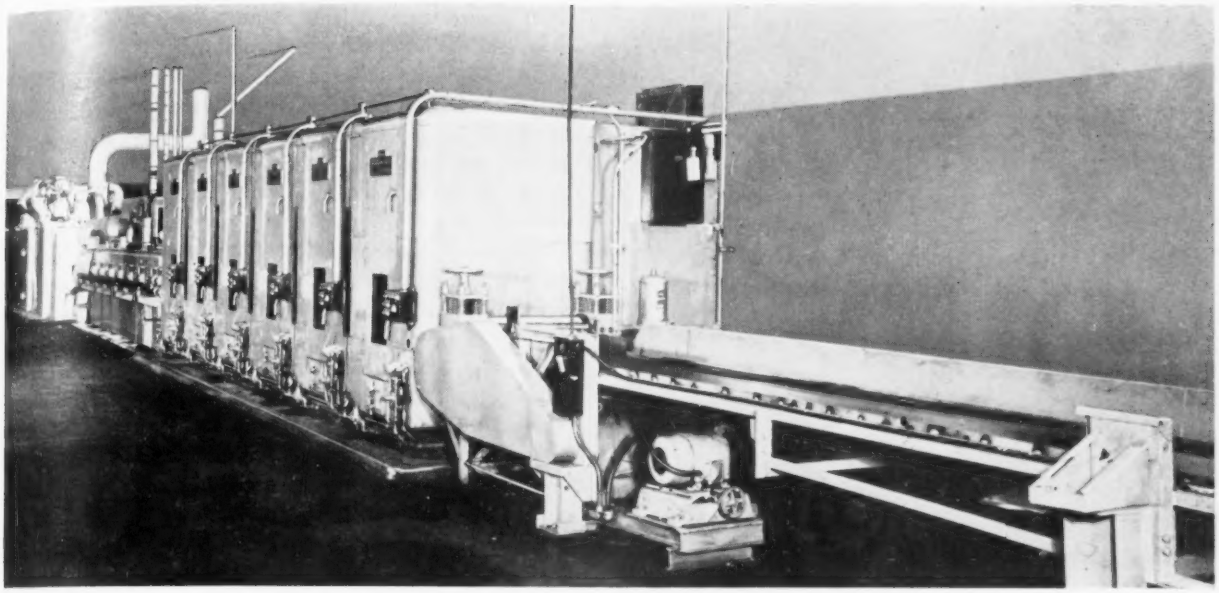
Made-to-order assemblies of belt machines are now available to make possible such advantages in the production of a wide variety of products, including automobile trim, fenders and bodies, refrigerators, stoves, metal desks, cutlery and watch cases. The method applies to both ferrous and non-ferrous metals.

The first advantage listed above—savings through the use of cheaper mill finishes on steel—is achieved because "pre-finishing" automatically generates a pit-free high-luster surface. This often eliminates the need for mill cold finishing with the resultant mill extras, thus providing economies so substantial that the "prefinishing" equipment often can pay for itself on this count alone.

* *Mr. Johnson heads the New Methods Development Section of the "3M" Abrasives Div., Minnesota Mining and Mfg. Co., St. Paul, Minn.*

Schematic Diagram of Tandem "Pre-finishing" Machine Layout





Prefinishing set-up with six grinding and polishing machines in tandem.

The second advantage—lower unit costs with increased plant capacity—is traceable primarily to three factors: (1) elimination of hand-finishing after forming with the resultant increase in pieces per man-hour; (2) elimination of straight-line automatics with their large floor space requirements and (3) easier and faster routing through plants, with less handling.

Longer life of dies is due to the clean steel and to the plastic coating which is applied immediately after polishing and which protects the dies as well as the metal being formed. In addition, the polished metal, plastic-coated for forming, permits the use of new, high quality dies.

Fewer rejects and greater "eye-appeal" are advantages that go almost hand-in-hand. Elimination of the human variable in hand-polishing also eliminates the reason for most rejects, and the uniform polish that is accomplished with "pre-finishing" assures proper conditioning for even the most remote fillets and recesses.

Belt Finishing Operations

The machine used in pre-finishing has a grinding head that consists of a back-up roll (often called a "contact wheel") over which an abrasive belt runs. Grinding heads (consisting of the back-up roll, the abrasive belt that runs over it, the pinch feed rolls, the pressure roll and the idler roll) vary in width from 10 to 75 inches. Two or more machines are used in tandem in order to provide a progression of mineral grits from coarse to fine.

A line-up of six machines for finishing auto bumper stock is not uncommon. The steel sheets or bars are placed on a conveyor which carries the metal through a scrubbing machine and then into a set of pinch rolls. The pinch rolls feed the metal under the grinding head, and pressure is maintained with a pressure roller directly under the steel below the grinding head.

Varying belt speeds are employed, from 4,500 to 6,000 surface feet per minute, resulting in production of as much as 40 feet of metal stock per minute, and more.

On hot-rolled stock, usually one or two heads or more of grit 60 or grit 80 are used to rough the metal, accomplishing an overall stock removal of .002"-.003" in order to condition the steel for plating.

The roughing heads are followed by a series of grits of 100, 120 and 150. After these come the polishing of 180 to 240, used with oil or grease. (For bright nickel work, grits up to 400 are used.) Aluminum oxide mineral grain is usually used throughout the "pre-finishing" operation.

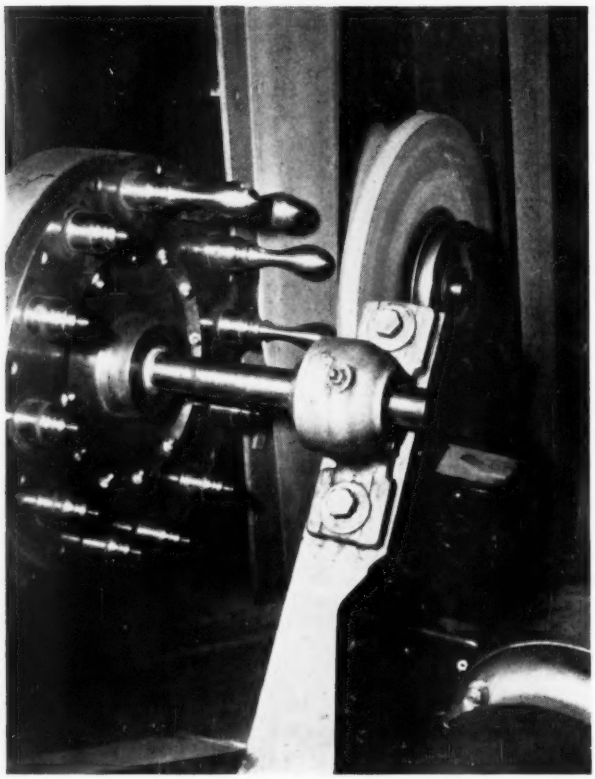
Paper-backed abrasive belts are used in most instances. However, there are some very successful installations where steel is ground in oil or in water, the latter requiring waterproof belts.

One can readily visualize the problems that arise when trying to finish some of the new streamlined auto bumpers after forming with straight-line automatics and charged wheels.

Those problems virtually all disappear in the "pre-finishing" method:

1. Finishing the metal "in the flat" assures complete coverage of all recessed areas and returns developed in the subsequent forming.
2. Wavy surfaces and wild strain lines often encountered with glue wheel automatics are eliminated.
3. The entire surface of the metal, uniformly polished, responds to identical treatment, especially valuable in view of recent developments in bright nickels and electrolytic polishing. There are no spot-finished areas to require additional contact time with the finishing medium.
4. New types of steel and steel treatments minimize stretcher strain and enable the polished flat sheet to be formed with little or no handwork necessary after forming.

All of the foregoing contributes to a better-appearing finish, which in turn has been proven to be more stable and more resistant to the corrosive effects of weather, since the surface treatment, whether plating,



Contour polishing crank handles using a semi-automatic that revolves parts while they are being polished. One hundred crank handles are finished in about 12 minutes in this way.

lacquering or enameling, has clean, evenly-polished parent metal to adhere to.

Pre-finishing is not only applicable to heavy gauges in bars and sheets but to light gauge sheets and coils, both ferrous and non-ferrous.

Reconditioning Rusted Steel Stock

Still another advantage of the "pre-finishing" technique is the availability of the equipment for reconditioning steel that has rusted, a not uncommon experience of steel users who maintain large inventories.

Ordinarily, reconditioning such metal is a costly proposition, but with pre-finishing equipment, simple rust removal and general clean-up can often be accomplished with just one grinding head.

The stainless steel mills have been using comparable equipment for years for salvaging stainless steel strip that is sub-par in quality. Such strip is rough-ground 40 to 50 points above order gauge and cold-reduced to a bright, scratch-free, pit-free surface. Now, pre-finishing equipment makes a similar economy available to the steel user.

Other Modern Polishing Techniques

Entirely apart from pre-finishing are the economies made possible by other new abrasive methods for products that do not lend themselves to "pre-finishing".

Involved here are automatics and contoured back-up rolls, usually used together. They afford economies in the grinding and polishing of a wide variety of products with curved and irregular surfaces.

The contoured back-up roll is simply a roll that is contoured in the mating shape of the metal piece that is to be ground or polished. The abrasive belt runs over the roll, presenting an abrasive surface that conforms to the contours of the metal piece.

In the most common mechanical arrangement for an abrasive belt machine, without a contoured back-up roll, two rolls support the belt—an idler roll at one end of the belt loop, and a back-up roll (which also serves as the drive wheel) at the other end. However, the use of a contoured back-up roll requires a three-roll arrangement—an idler roll at one end of the belt loop, a drive wheel at the other end, and the contoured back-up roll in between in such a position that it deflects the belt outward from 3° to 7°. With the proper positioning of the contoured back-up roll and the proper tensioning of the abrasive belt, the belt easily follows the contours in the roll.

Often used in connection with contoured back-up roll is automatic equipment (generally referred to as semi-automatics). This equipment carries the metal product to the belt, revolving it during grinding and polishing, and then releases it. Combining such equipment with the contoured back-up rolls results in a uniform finish that is achieved automatically.

Belts used are usually standard heavy-construction cloth belts, except in the case of especially severe contours which require lighter cloth constructions. Mineral grain sizes may range from grits 24 to 400, in either aluminum oxide or silicon carbide.

Wheel wear, with its attendant mal-performance, is virtually non-existent, since the abrading is done by the belt instead of the wheel. As a result, the wheel remains in balance indefinitely; accuracy of contoured shape is easy to maintain, and sharp contours can be accommodated. Prior to the development of abrasive belt equipment for this type of work, only the simplest of concave and convex surfaces and similar mild forms could be handled.

The new-type installations may involve a number of belt grinding machines, with the various contoured back-up rolls at different angles in straight line or rotary assembly in order to accommodate varying contours on the metal piece.

The use of abrasive belts provides a speed of cut and fineness of finish that permit fewer finishing heads that would otherwise be necessary, resulting in less maintenance, less floor space, and a simplification of operations that lends itself readily to faster production.

Some installations, as in the case of grinding and polishing a simple concentric metal piece in a thrust cut, may require only a single formed roll. Typical is the installation at *Balcrank, Inc.*, of Cincinnati, manufacturer of machine handles and lubricating equipment. The Balcrank company used a revolving jig to bring the steel crank handles into contact with the abrasive belt, and to turn the crank handles during the polishing operation. The abrasive belt was backed up by a mating-contoured contact roll. Similar but modified equipment has been adopted by most major wrench manufacturers to remove split marks and to round the shanks of wrenches.

The contoured back-up rolls are usually of rubber or cloth and are either purchased made-to-order or are easily carved to the desired shape by the user. Belt speeds range from 5,000 to 7,000 surface feet per minute.

Shop Problems

METAL FINISHING publishes, each month, a portion of the inquiries answered as a service to subscribers. If any reader disagrees with the answers or knows of better or more information on the problem discussed, the information will be gratefully received and the sender's name will be kept confidential, if desired.

Converting Cadmium to Zinc Plating

Question: At present we have four cadmium tanks, one cyanide zinc tank and one acid zinc tank. My company feels that it would be better to throw out the cadmium tanks and replace them with one cyanide zinc tank and thus save on the high cost of cadmium plating. Before doing this we would like your opinion on the relative merits of cadmium vs. zinc for general purpose plating on steel. Why does cadmium cost so much more than zinc? It seems to me that we could buy a lot of cadmium with the money that would otherwise be wasted by throwing away the present cadmium solutions.

W. C.

Answer: As far as the protective value of zinc vs. cadmium is concerned, it is generally agreed that there is very little difference between the two, except in some very special cases. The difference in price of cadmium and zinc is due to the scarcity and high refining cots of the cadmium, and does not reflect its true value as a protective coating.

In regard to the change-over from cadmium to zinc, it is not necessary to throw away your present cadmium solution or tanks. You can remove the cadmium anodes and replace them with stainless steel sheet anodes and continue to plate from the bath until the cadmium is depleted from the solution or until a satisfactory plate can no longer be obtained. The solution can then be discarded as it is now practically worthless. If it is a very old solution it probably contains a high percentage of carbonate and other materials and it is better to discard it than to try to purify it any further. If you do not want to discard the bath you can simply insert zinc anodes in place of the stainless steel anodes and proceed to plate zinc in the normal way. Any small amount of cadmium left in the bath would co-deposit with the zinc until it is entirely consumed and under normal circumstances should not introduce any difficulties.

Your present cadmium tank equipment is also suitable for zinc plating, but of course the added advantage of having one large, single solution lends itself to better control than your present operation of four separate tanks. There are certain production considerations involved in such a change, such as rate of operation, versatility, etc., which should also be considered.

Buffing Plated Plastics

Question: After plating some plastic sign letters with copper, we have to color the copper up a little to get a bright finish. In doing this the copper plate seems to stretch and get wavy on the face of the letters, even though we use the greatest of care. Can you give me any information on how to do this without these effects?

C. C. T.

Answer: The trouble you are experiencing is due to the heat generated by the buffing operation, together with poor adhesion of the metal coating. This affects the plastic and causes it to flow under the wheel pressure. If these letters were made of a thermosetting type of plastic this would not occur. Buffing the parts under a stream of water might help prevent distortion, but the best results would be obtained by plating the copper from a bright copper bath or burnishing the letters after plating in a barrel. A much heavier copper plate would also help alleviate the problem, as the heavier metal layer would not so easily deform with the plastic underneath.

Sodium in Nickel Plating Baths

Question: We would like to know if sodium chloride can be used in place of nickel chloride for dull nickel plating? This salt is more readily available in this country (Sweden), but we do not know the effect of the sodium ions on the plating results, except that it seems to minimize pitting. Can you give us some information on this?

Q. C. H.

Answer: The use of sodium chloride in nickel solutions was discontinued after the discontinuance of double salts. The only work done on the affect of sodium chloride on a nickel deposit was that of *MacNaughton*, I believe, in which its affect on hardness was investigated.

There is a difference of opinion as to what occurs when sodium chloride is used. I contend that a hydroxide is formed at the cathode. Others claim that the decomposition voltage is not high enough to dissociate the sodium chloride. I have collected chlorine gas that was given off at the anode in a solution of single nickel salts and sodium chloride. Repeated this a number of times. It appears that sodium is released at the cathode but at once combines with water and forms a hydrate with nickel. This is confirmed by the finding of nickel hydroxide in the deposit. The solution becomes quite rapidly alkaline, requiring a frequent adjustment of pH.

Pitting and hydrogen gas are closely associated, and an alkali film at the cathode will probably prevent the formation of hydrogen. There will be, however, the development of a hydroxide that will be included in the deposit of nickel and cause brittle and rough deposits. The use of sodium chloride is not advised. It would be better to use some anti-pit agent such as is used in bright nickel solutions so that the surface of the work will be readily wetted and prevent the adher-

ence of gas bubbles. Continuous filtration at a rapid rate would be better than air agitation.

(*Answer by Mr. G. B. Hogaboom*)

Green Gold Plating

Question: I have been informed that I could darken the green shade of my gold plating by adding cadmium cyanide to my regular sodium green gold solution. I would like to get a deep grass-green. I can't seem to locate a supplier of cadmium cyanide. Can you give me any advice in this matter?

D. F.

Answer: While you may be able to get a certain amount of green color to your gold by adding cadmium, it will not be possible to get a grass-green. At best there will be not much more green to the shade than would be produced in one of the standard green gold formulations. Cadmium cyanide can be made by dissolving common cadmium oxide in a solution of sodium cyanide. About 1.2 oz. of sodium cyanide are required to dissolve each oz. of cadmium oxide.

Removing Carbonates From Cyanide Baths

Question: We have recently run into difficulty with rough plating in our copper cyanide solution. We never had this trouble before from this solution, and the only thing we have done to the bath recently has been to remove the carbonates from it with carbonate remover. We only treated half of the solution this time with the carbonate remover, as we could not hold up production. The copper bath seems to be cloudy now too, in spite of the fact that we filtered it before running it back to the main solution. We would appreciate your recommendation.

F. T. N.

Answer: When you treated a portion of your plating bath with the carbonate remover you probably added an excess over and above what was actually required to precipitate the amount of carbonate present in that portion. This excess of carbonate remover dissolved, and was carried back into the other half of the bath through the filter. When it reached the carbonates in the second half of the solution it precipitated them, which is the cause for the cloudiness in the solution and also probably the cause of your rough plating. Filtering the entire bath again should clear up your trouble.

Spotted Plating

Question: We are sending you samples of some nickel plated parts which show small brown spots after final drying. These brown spots do not show up immediately after plating, but after standing around for several days the spots develop. The water in this section of the country is very hard, but we use water softeners to offset this as much as possible. Inasmuch as these parts are made of cold-rolled steel, which is not porous, we do not know what is causing this spotting. We would appreciate any suggestions you could make on this problem.

Y. L. P.

Answer: Examination of the sample submitted clearly indicates that the spots, which may be rubbed off, are due to chemicals left on the surface after the parts are completely dried after plating. There is spotting only on the ends of the parts that are in the lowest position on the rack during the plating operations, but the nickel plating elsewhere on the part seems excellent. It is doubtful if the chemicals contained in your water supply could cause corrosion of the nickel to form these dark spots, therefore we would suspect that your final rinsing tank arrangement is at fault. Be sure that the inlet for fresh water to your final rinse tank is at the bottom of the tank. Dissolved chemicals in the final rinse will gradually form a fairly concentrated layer of solution at the bottom of the tank if it is not stirred up and removed. Many rinse tanks have a simple water inlet at the top of the tank which is not efficient in thoroughly stirring up the rinse. In such cases the rinsed parts may still have some chemicals left on their surface after drying. These chemicals in time will cause corrosion and staining. Using a spray rinse as a final step will also eliminate this trouble.

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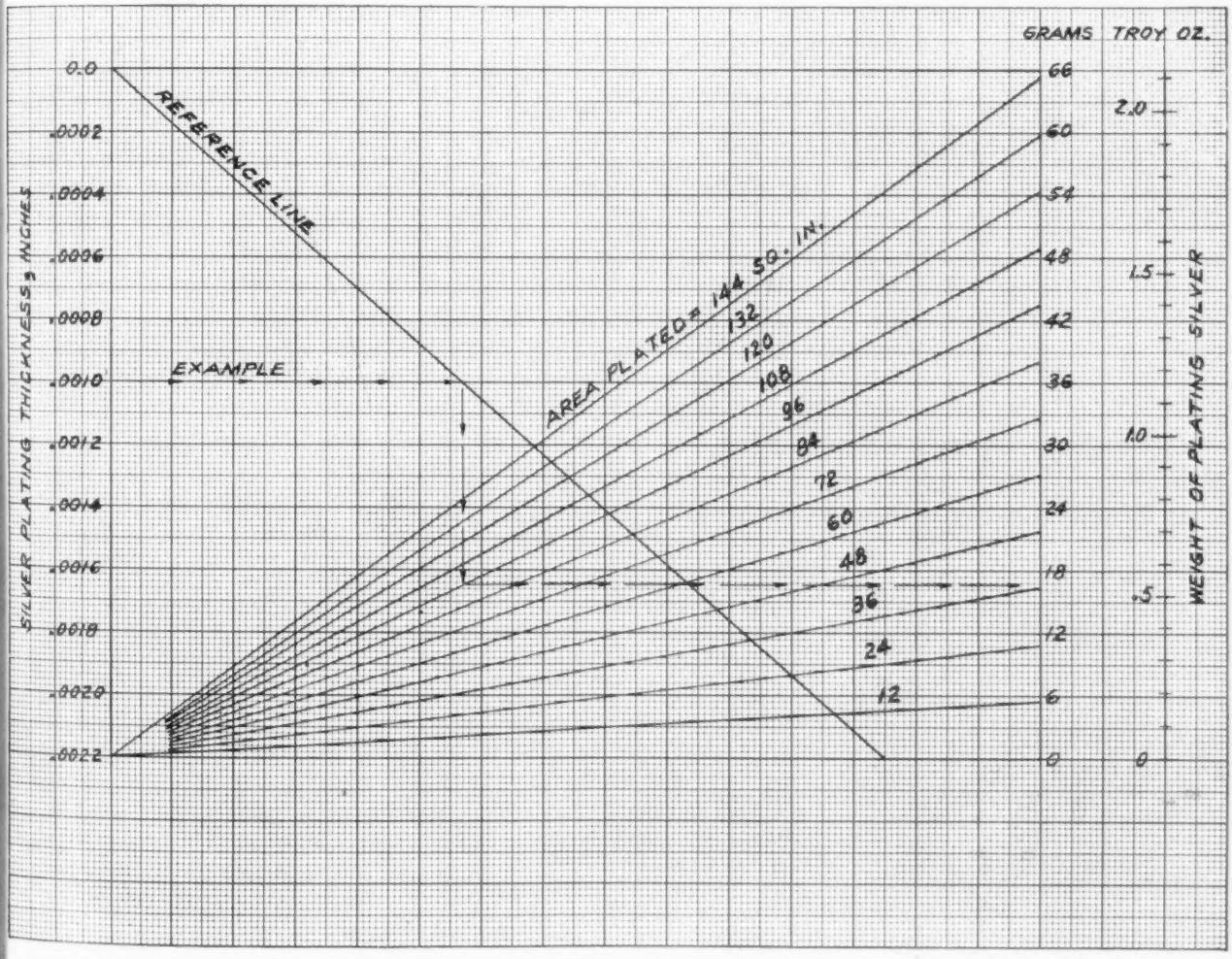
Calculating Metal Cost in Silver Plating

With the aid of the chart below it is a simple matter to calculate the metal cost for depositing a given thickness of silver on a known surface area. The example shown by the dotted line illustrates the calculation for a deposit of .0010" of silver on a surface of 96 sq. inches. Weight of silver is given in Troy ounces. The chart below is for fairly heavy silver deposits. For thinner deposits the appropriate fractional conversion can be made. The weight of silver metal can be converted to the equivalent weight of silver salt by multiplying by the following factor:

Silver to Silver Cyanide = 1.25.



Recent Developments

New Methods, Materials and Equipment for the Metal Finishing Industries

New Process for Electroplating on Aluminum

MacDermid, Inc., Dept. MF, Huntingdon Ave., Waterbury, Conn.

This firm recently announced their newest chemical process, called Alumetex Process which, according to their reports, eliminates many of the pitfalls encountered by manufacturers who do electroplating on aluminum.

Some of the outstanding features claimed for the Alumetex process are:

a. One process for all regularly used alloys of aluminum.
b. Excellent corrosion resistance and adhesion obtained by simple immersion treatments.
c. Complete elimination of blisters, pits, and dull deposits.
d. Processes sand castings, die castings, and wrought aluminum through the same cycle.

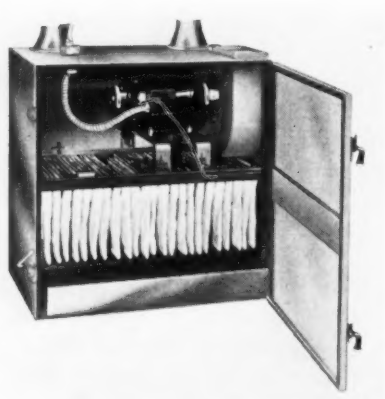
The Alumetex process has been tested and proven in production for the past three years, under various conditions, at one of Detroit's largest job plating plants, it is claimed.

In order to prove the superior qualities of the Alumitex process, manufacturers are invited to send samples for plating. Be sure to specify the type of plate and thickness of deposit required.

Dust Collecting Units

The Hisey-Wolf Machine Co., Dept. MF, Cincinnati 8, O.

The above firm announces a new dust collecting unit for use with polishing and buffing operations. With this unit the air is exhausted back into the room, eliminating the need for expensive duct work and providing a saving in the cost for heating the air. The contaminated air is filtered through closely woven fabric and steel wool filter bags, and the heavier particles are directed downward by a baffle plate directly to a large collecting tray. The filter bags are also easily shaken free of their clinging dust by a convenient foot lever at the side of the cabinet. The dust falls into the tray which is then easily removed for dumping. These units are available in capacities from 235-1025 C.F.M., all with two inlets for servicing two polishing or buffing wheels. Complete details may be obtained by writing to the above address.



Plating Kit

Guild Laboratory, Dept. MF, P. O. Box 3194, Barnum Sta., Bridgeport, Conn.

This firm announces their new portable plating set known as the Guild Plate-Kit, which can be easily operated and needs only a 110 v. AC power source. It is claimed to be especially useful to jewelry and precious metal repair shops, hobbyists, technical schools, and similar institutions where a small plating outfit is required. This firm also supplies the necessary solutions for nickel, silver, cadmium, and brass plating, and also offers a consulting service on electrochemical problems.

Solenoid Valves

A.A.A. Valve Co., Inc., Dept. MF, 357 Canal Street, New York, N. Y.

The above firm announces the introduction of a new line of solenoid valves. These new improved valves assure leak proof, quick acting, and efficient operation. The internal parts are of brass and stainless steel, all with packless type heavy duty solenoid. For pressures from zero to 300 P.S.I., and temperature zero to 500°F. These improved A.A.A. Solenoid valves are built for water, air, steam, gas and other applications. Also custom built valves for special requirements.

Complete descriptive literature is available.

Liquid Cleaner for Electric Motors

E. I. Du Pont de Nemours & Co., Electrochemical Dept. MF, Wilmington 98, Del.

A new formula has been developed by the above firm for a cold liquid cleaner particularly suitable for use on electric motors and generators, and effective for general machine and automotive maintenance.

This compounded product, called "Cleaning Mixture No. 49," is said to possess the qualities required of an effective cold spray for use in electric motor cleaning, automotive repair, and general maintenance. It dissolves grease rapidly, evaporates quickly and is practically inert to ordinary electrical insulating materials, it is claimed.

Low flammability and mild toxicity together with its excellent service performance, make it a desirable substitute for other compositions which have heretofore been generally used in electrical maintenance, it is claimed.

Technidrier

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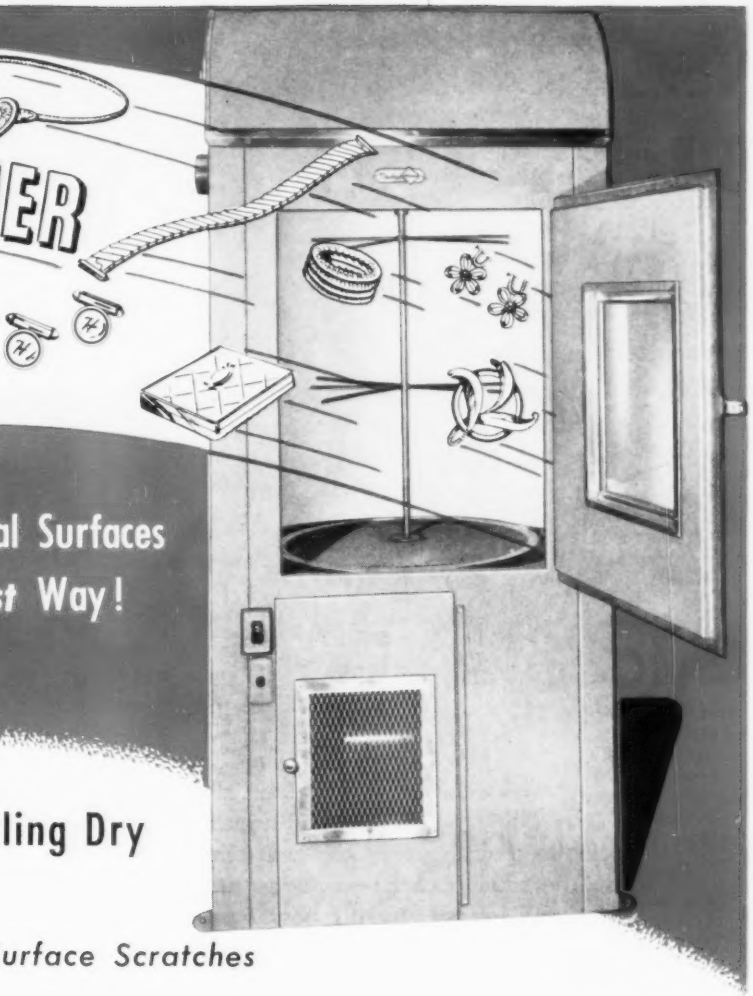

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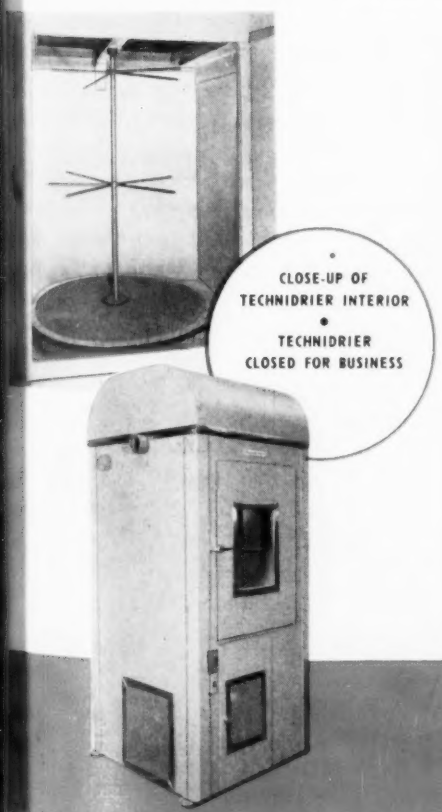

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Air Temperature	normal operation — 200° F.
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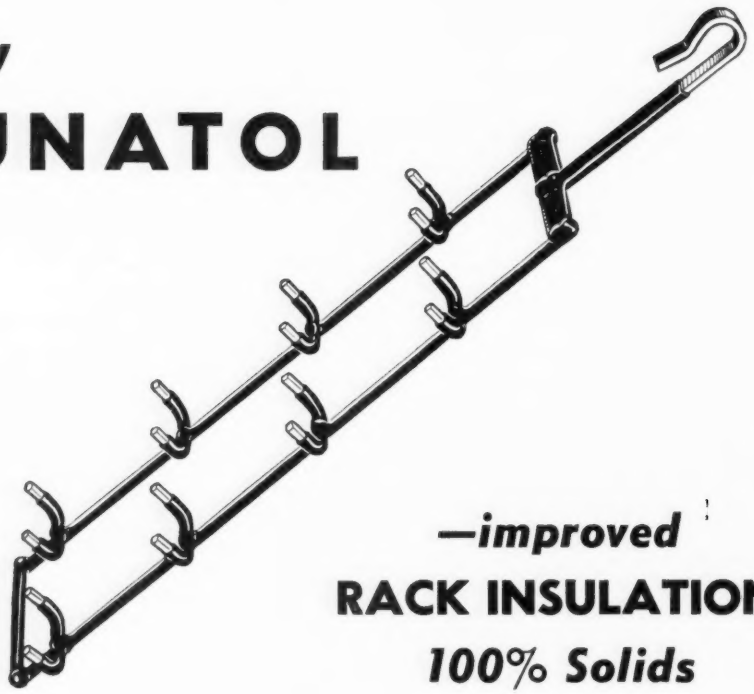

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Rack Insulation Exclusively

New Finish for Aluminum

Allied Research Products, Inc., Dept. MF, 4004 E. Monument St., Baltimore, Md.

Iridite Alcote, a chromate-type, corrosion resistant finish for aluminum has been announced by the above firm.

Like the Iridite finishes for zinc and cadmuim, Iridite Alcote is applied to parts by a simple, non-electrolytic dip with the solution operating at room temperature. No fumes are given off during processing and consequently no exhaust systems are required. The coating ranges in color from clear to light bronze and may be obtained from as short an immersion as 10 seconds. For greatest color intensity and optimum corrosion resistance, the immersion time should be set at 2 minutes.

Salt spray tests indicate resistance to corrosion for as long as 1000 hours on wrought stock and 250 hours for castings depending upon alloy and treating time, it is claimed. Tests to determine the paint base characteristics of the coating indicate that Iridite Alcote provides excellent adherence for the paint to the metal. The paint film thus bonded to the Iridited surface provides highly corrosion resistant paint systems comparable to more costly electrolytic systems, according to the firm. The coating is claimed to be highly resistant to abrasion. Treated parts may be buffed, mechanically and roughly handled or formed, without affecting the coating.

CORRECTION

In The Lea Mfg. Co.'s advertise on the front cover of the Februa sue of Metal Finishing there was fortunately an error in one of the ures used in connection with the L TROMAG, a portable instrumen measuring plating thickness. The vertisement read: "non-magnetic ings on carbon steel or iron ran from 0.0002 to 0.0009 inches are m urable with the following accura plus or minus 10% for thickn 0.001 inches and over; plus or m 15% for thicknesses under inches." The above range should read: "from 0.0002 to 0.008 inch

New Magne-Gage for Heav Deposits of Nickel on Stee

American Instrument Co., Dept. MF, Silver Spring, Md.

A new special-purpose Magne for measuring the thickness of n coatings on iron or steel in the r of 0.001 to 0.0045 inch, by mag means, without injuring the coatin base metal, is announced by the a firm.

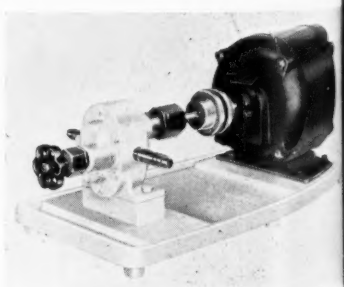
This thickness range is beyond of the standard Magne-Gage (wh measures thickness of nickel coat on iron or steel from 0 to 0.002 in and can not be supplied on Mag Gages having other calibrations.

Stainless Steel Self Priming Pu

Ertel Engineering Corp., Dept. 22 Front St., Kingston, N. Y.

This firm announces the manu ture of a new group of stainless s self-priming pumps as an additio its liquid handling equipment lin

The new units will be designated Model ESP. They are available in sizes, in the following gallons



minute at zero pounds pressure gpm., 5 gpm., 10 gpm., 20 gpm. 30 gpm.

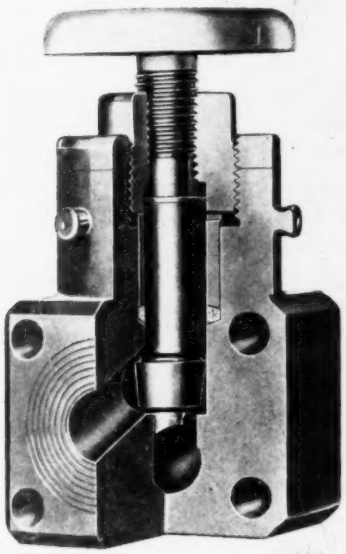
The design is extremely comp and insures perfect alignment of

minimum of moving parts, it is claimed. Handy manual by-pass control valves are included on each pump to easily regulate pressure and flow rate. All sizes are available as individual units or as complete pump assemblies, direct drive or belt driven.

Graphite Corrosion-Resistant Globe Valve

National Carbon Div., Union Carbide and Carbon Corp., Dept. MF, 30 East 42nd St., New York 17, N. Y.

A newly designed "Karbate" Brand impervious graphite globe valve is an-



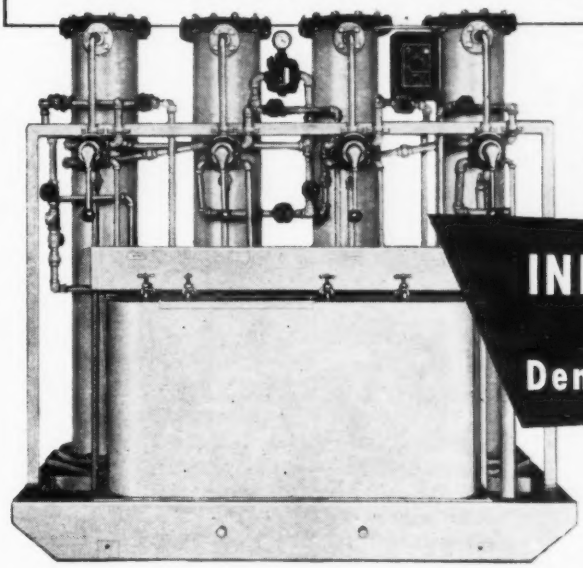
nounced by this firm. The valve, in 1" and 2" sizes, is designed for shut-off and throttling service with corrosive fluids free from abrasive solids. Except for the Teflon packing, all valve parts in contact with the fluid are Karbate impervious graphite.

The outstanding features claimed for the new globe valve are its resistance to practically all corrosive chemicals, including hydrochloric acid, dilute sulphuric and hydrofluoric acids and chlorinated organic compounds, and its resistance to thermal shock. Because of the excellent thermal conductivity of impervious graphite the valve may be readily heated from a steam coil of copper tubing wrapped around it, when heating is required for handling highly viscous or saturated solutions.

The tapered disc valve seat is claimed to assure accurate and close control of fluid flow, and it is self-reseating. The valve is light and small, has short face to face dimensions and is self-lubricating. Sturdy and com-

Eliminate Hot-Rinse Stains Unwanted Precipitates

USE CHEMICALLY PURE WATER



only a few cents a thousand gallons with . . . .

INDUSTRIAL Water Demineralizers

A four-bed Industrial Water Demineralizer. Standard two- and four-bed units available with capacities of 200 to 1000 qph. Special units of any capacity –engineered to requirements.

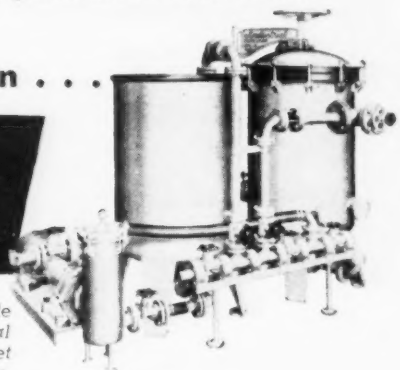
and it's as simple as it looks . . .

besides the extremely low cost, there is nothing complicated about getting the chemically pure water with Industrial Demineralizers. Raw water is passed through either two or four beds of ion-exchange resins and it comes out free of the dissolved mineral salts. No still, heat, steam, or cooling water is needed—keeping space requirements relatively small.

And it's simple to get the complete facts for your case. Send us a water analysis and let us know how much water you have to treat and the gallons per hour needed. We can then give you the whole demineralizer story including estimated costs, equipment required, performance data, etc. for your requirements.

for solution clarification . . .

use an INDUSTRIAL Filter



100 to 15,000 gallons per hour. Portable and stationary models. Standard or special filtration systems engineered to meet unusual requirements.

Write for full information and recommendations

FILTERS Pressure Type · PUMPS Centrifugal · CORROSION TESTING APPARATUS Salt Fog • Humidity

INDUSTRIAL FILTER & PUMP MFG. CO.

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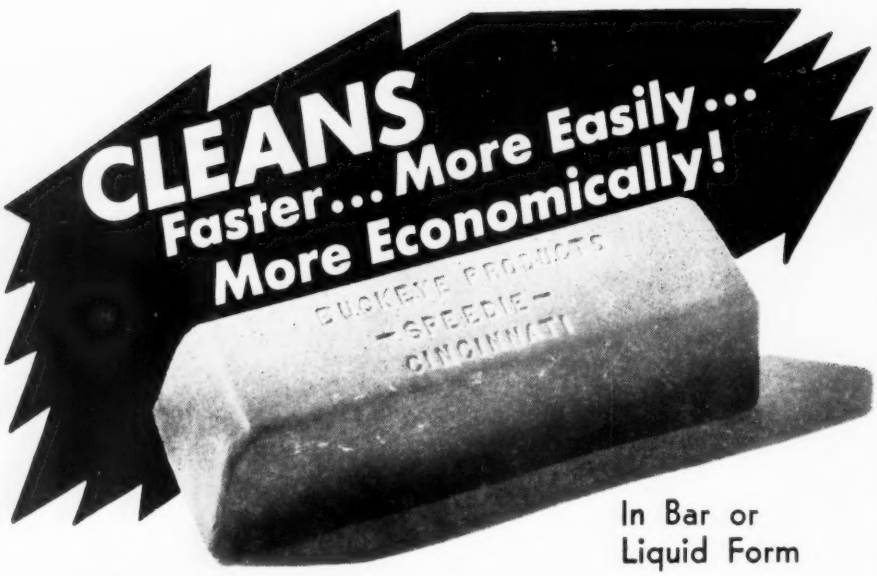
RUBBER DIVISION Vulcanized Linings • Molded Products

WATER DEMINERALIZERS



SPEEDIE Tripoli . . .

NOW . . .
SPEEDIE
"Spray It" Tripoli
No. 2072
Liquid — just spray it on. Water soluble. Stays in suspension. Will not clog lines or nozzle. Job-proved!

SPEEDIE Tripoli Compositions have long been known as "always-uniform products" which provide maximum cleaning efficiency with minimum time and labor!

For brass plumbing fixtures and die castings, the old reliable No. 607 can't be beat! No. 431 is 100% saponifiable—it cuts and colors beautifully.

No. 1074 is unmatched for name plates, emblems, and aluminum. For buffing all non-ferrous metals there is No. 1639 which *readily emulsifies in hot water*, eliminating cleaners.

For further information on these quality, job-proved SPEEDIE Tripoli Compositions, and a free, handy Catalog-Reference Book for your polishing shop, write today!

BP **THE BUCKEYE PRODUCTS CO.**
7033 Vine Street Cincinnati 16, Ohio
Cable address: Buckprod

pact construction ensure long life, trouble free operation and ease of installation, it is said.

Corrosion Resistant Pipes and Valves

F. D. Pace Co., Dept. MF, 69-73 Scribner Ave., N.W., Grand Rapids, Mich.

The above firm manufactures a complete line of pipes, tees, elbows, reducers, Y's, etc., lined with acid and alkali resistant Pacite. Lengths of pipe up to 10 feet are available in all sizes, with various plastic lining thicknesses to suit requirements. Pacite is claimed to withstand temperatures from 20 below Zero to 180° F. It has a very smooth finish, is free of pin holes, and has excellent bond strength to the metal pipe. Further details may be obtained upon request.

Respirator Protects Against Dusts, Gases and Vapors Through Interchangeable Filters

American Optical Co., Dept. MF, Southbridge, Mass.

A new line of twin cartridge respirators specifically developed to provide protection against seven respiratory hazards through a basic face piece and seven interchangeable filters is announced by this firm.

The basic face piece of the new respirators is molded from durable rubber and has a new "rolled" edge that curves inward to give a snug fit without leakage. Other features include a new flexible fitting brace for shaping the respirators to individual features, a highly efficient inhalation and exhalation system and increased field of vision through thinner filter cartridges.

The seven filters developed for the respirators are said to provide protection against the following:

1. A combination of all dusts—toxic, pneumoconiosis-producing and nuisance dusts as small as 24 millionths of an inch.
2. Low concentrations of light organic vapors and gases met with in paint spraying, degreasing, dry cleaning, cementing, and similar operations.
3. Low concentrations of acid gases and mists such as sulphuric acid, hydrogen chloride and acetic acid.
4. Low concentrations of combined acid and organic gases like halogenated hydrocarbons, aniline and hydrogen chloride.
5. Low or nuisance concentrations of ammonia only.
6. Low concentrations of organic vapors and all dusts when present simultaneously.
7. Fumes produced in welding, burning, smelting or refining operations, or in any operation in which metals are heated to high temperatures.

Cloth Bag Dust Collector

W. W. Sly Mfg. Co., Dept. MF, 4700 Train Ave., Cleveland 2, O.

In the new dust filter, recently announced by this firm, three advantages are claimed: (1) No more shutting down operation to remove accumulated dust from the bags; (2) longer bag life by the elimination of shaking or flexing; (3) no more gradual loss of efficiency due to building up of a dust layer on the cloth bags.

By frequent applications of blasts of reverse air, this new filter is said to prevent the accumulation of dust on the cloth bags. Created by the main fan of the dust control system, these blasts require no auxiliary equipment. All shaking mechanism has been eliminated.

The simplicity of design and operation and elimination of all auxiliary equipment for periodic cleaning of bags mean a saving of floor space and a very minimum of maintenance.

Present installations of Sly dust filters can be changed over to embody the Sly Dynaclone feature. There has been no alteration in the basic construction of the filter. The time required and cost involved depend upon the size of the filter.

The improvement in filter operation, the increase in efficiency, the reduction in bag wear and other costs are said to make the Sly Dynaclone a big improvement in filter design.

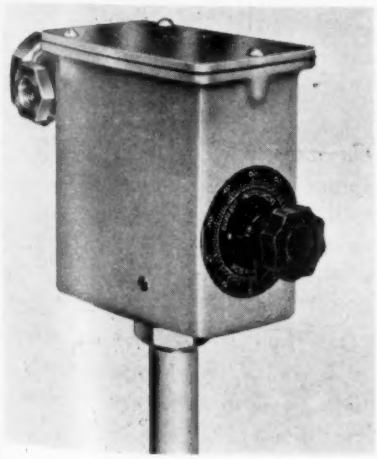
Temperature Controlled Valve

Burling Instrument Co., Dept. MF, 253 Springfield Ave., Newark 3, N. J.

This firm announces the development of their new self-contained temperature controlled valve that operates on the principle of the differential expansion of solids.

Classified as the Model Y, this temperature controlled valve consists of an aluminum cast case containing appropriate levers to multiply the direct expansion of the tube and supports a readily inter-changeable bronze spring closing valve (sizes ¼", ⅜", ½") with renewable discs for air, water, gas, oil, steam or gasoline.

With a broad temperature range from minus 300° F. to plus 1800° F., the "Y" is available in a variety of models including the YD with control knob and dial outside, the Y with temperature setting inside. These close valve on rise in temperature. For opening valve on rise in temperature there is the YRD with control knob and dial outside of case and the YR with temperature setting inside case.



Illustrated literature on this and other Burling temperature controls available on request.

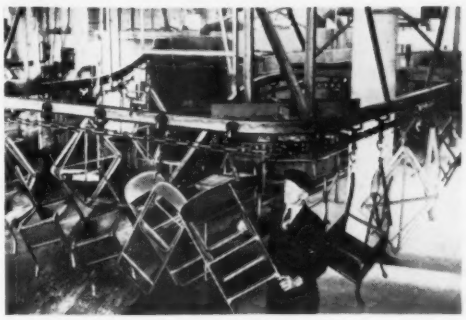
Prepared Palladium Plating Solutions

A. Robinson & Son, Dept. MF, 131 Canal St., New York 2, N. Y.

The latest development of this company is the introduction of assayed solutions for palladium plating, which will supplement its line of prepared precious metal plating baths for gold and rhodium. The quality of these precious metal plating baths is backed by the firm's 71 years of experience in the field.

Palladium plating provides a hard and durable white finish that is extremely resistant to corrosion and tarnishing. It has found wide application in the electronic and scientific instrument fields as well as in the jewelry and industrial fields. Purchasing the prepared baths eliminates much of the difficulty formerly encountered in preparing suitable plating electrolytes, and insures trouble-free operation and satisfactory results. Solutions are furnished with a guaranteed palladium metal content, and require only dilution to be ready for plating. Write to the above address for complete details.

Cold Cleaning Before Painting Saves Over $600 Per Month for Manufacturer



Parts to be Cleaned: Steel tables, chairs, bridge sets, desks, etc., to be cleaned after stamping, forming, welding and assembly. Final operation: Spray Painting.

Former Method: Hot alkaline spray cleaning followed by two rinses. Cleaning satisfactory, but heating fuel costs too high.

New Magnus Method: COLD process. Spray parts with cold 3% solution of Magnus No. 87X for 30 seconds. Follow with 15 seconds dilute acid cold rinse (Magnus No. 82XX, 5 oz. to 100 gals. water). Hot air dried. Work ready for painting.

Results:
1. Greatly improved product appearance.
2. Better paint adherence.
3. Cleaning and rinsing at room temperature result in monthly fuel savings of $306, PLUS savings of approximately $300 per month by eliminating rejects and labor to keep boiler going on night shift.
4. Lower expense for cleaning compound.

IMPORTANT—Write today for complete information on this new Magnus COLD cleaning method.

MAGNUS CHEMICAL CO. • 11 South Ave., Garwood, N. J.
In Canada — Magnus Chemicals, Ltd., 4040 Rue Masson, Montreal 36, Que. *Service representatives in principal cities.*

Magnus
CLEANERS • EQUIPMENT • METHODS

As Mama Says to Sonny

Start Clean . . . Stay Clean!

Keep Your Plating Bath Clean With Red Label DARCO S-51!

You invest a lot of time, labor, and money in preparing work for plating—*don't waste it by putting the work into a plating bath of questionable purity!*

Start clean . . . *stay* clean! Darco S-51 traps the trouble-makers that ordinary filtration just can't catch—adsorbs them to its surfaces before they can be deposited on the freshly cleaned surface of your work.

Red Label Darco S-51 is especially treated for use in plating—*it is the only carbon that will meet the benzol-mercury test!* It is especially easy to handle . . . to wet . . . to incorporate into a slurry. Place an order for Red Label Darco S-51 today. Practically all leading suppliers carry Darco in stock—*do not accept substitutes!*

Is your plating bath as clean as the water in your final rinse?

DARCO CORPORATION
60 East 42nd Street, New York 17, N. Y.

Salt Bath Descaling Process

Hooker Electrochemical Company, Dept. MF, Niagara Falls, N. Y.

The process makes use of a fused alkali bath followed by a water quench and a short acid dip for most applications. For stainless alloys a second dip in nitric acid is used to brighten and passivate the surface. The method is economical simple and safe in operation, it is claimed. In the few industrial installations to date, over 16 different types of ferrous metals have been successfully descaled. Among these are high alloy steels, tool steels, cast iron and wrought iron. Any shape can be processed, including rods, bars, wire, tubes, sheets, strips, and even forgings, castings and fabricated parts. In some cases two jobs are done at the same time, as for example the combined stress relieving and descaling of auto bumper brackets.

Generally speaking, the Hooker descaling process is applicable to any metal or alloy which is not attacked by molten caustic soda at 930°F., or whose physical properties are not adversely affected at this temperature. Mill scale, heat treating scale and rust are all converted to an acid soluble oxide. Acid consumption is relatively small and the Virgo Salt bath may be used for years with only small additions to replace drag-out, according to the firm. The time cycle is short, making possible the handling of a large amount of materials in a given time. The molten salt bath is an inert, quiet liquid which minimizes hazard in operating the process.

For the Virgo Salt bath a mild steel tank is used, and any of the three conventional methods of heating may be employed (external gas firing, immersion tubes of various types or immersion electrodes). Except for temperature controls, no auxiliary equipment is required. Other equipment required is relatively simple, consisting of a tank for water quench and an acid dip tank. For stainless steels a second acid tank for nitric acid dip is needed. For batch operations a traveling overhead monorail crane handles work from one tank to the next. The process is applicable to continuous work for strip, wire, and wire rod.

New All-Angle Belt Grinder

H. L. Ramsay & Co., Dept. MF, 630 S. 10th Ave., La Grange, Ill.

A belt grinder, the Expeditor, which can be set at any angle has been announced by the above firm. The Expeditor is mounted on an axis that centers at the motor shaft, and with one turn of a clamp nut the abrasive belt can be set at any angle. Several Expeditors can be set above each other so that the contact wheels or platens of the several may be directly in front of the operator. In this set-up the worker can rough, semi-finish and finish grind with little movement.

The Expeditor is designed for free belt operation; form wheel work, or

contour grinding; line contact grinding when much stock is removed; for platen precision grinding either above or below. It is quickly set up or reset for any such operations, it is claimed.

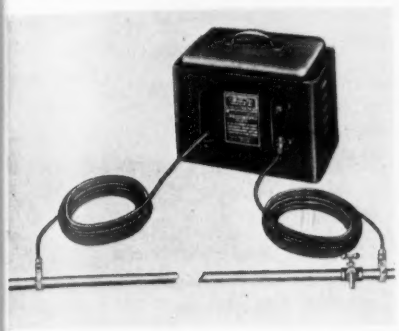
The front contact roll is made of aluminum, a drive belt serves as a resilient or cushion. Various densities are available.

Pipe Thawer

Trindl Products Ltd., Dept. MF, 17 East 23rd St., Chicago 16, Ill.

A broader field of usage for the new improved Trindl Portable Electric Pipe Thawer is announced by the manufacturer.

Originally designed for thawing iron



water pipes, the machine has been re-engineered and will now handle copper tubing and lead pipes. A thermostatic control (optional equipment) permits automatic regulation of temperatures, thus bringing the device into scientific and laboratory usage as well as simplifying general thawing operations. Application has also been extended to other commercial needs for heating pipes carrying non-combustible liquids and where lower viscosity is required. The new model opens a market in general property maintenance and commercial uses where heating of fluids is necessary to promote free flowing. The new model is said to thaw a 1½" pipe 30 feet in length in a matter of minutes.

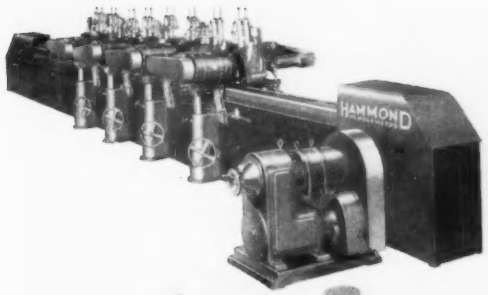
New Ion Exchange Process Delivers High-Quality Water

Resinous Products Div., Rohm & Haas Co., Dept. MF, 226 W. Washington Square, Phila., Pa.

Extraordinarily pure water containing less than one part of ionic solids per 100 million parts of water can now be produced by simple passage through a mixed bed of Amberlite ion exchange resins, it is claimed by the above firm. The new technique permits complete removal of inorganic salts without deviation from chemical neutrality (pH 7.0), it is claimed. Other asserted advantages of the new mixed-bed process include: reduced costs of both equipment and regeneration; lower rinse requirements; uniform performance in intermittent service; and a sharp breakthrough at depletion of the bed.

Water equivalent in ionic purity to a triple-distilled product, as delivered by this technique, is regarded as entirely suitable for the rinsing operations employed in electroplating automobile accessories, in manufacturing photographic film, and in preparing mirrors for silvering. Many other applications are being uncovered daily, particularly in industries which must effect complete removal of inorganic salts at pH 7.0.

The mixed-bed system, according to the men who developed it, has several advantages over conventional two-bed ion exchange systems. In the mixed-bed process, the solution to be treated is passed through an intimate mixture of Amberlite IRA-400 (hydroxyl form) and Amberlite IR-120 (hydrogen form). Such a mixed bed may be regarded as a multiple-bed deionization unit consisting of an infinite number of cation and anion exchange columns arranged alternately in a series. IR-120 is a strongly acidic cation exchange resin capable of adsorbing metallic ions from solution while releasing an equivalent amount of hydrogen ions. IRA-400 is a strongly basic resin which splits salts in an exactly opposite sense: that is, it adsorbs the chloride, sulfate, carbonate and other anions from solution, releasing an equivalent amount of hydroxyl ions. Thus it is said that the intimate mixture of the two resins produces an effluent water essentially free of all ionized materials.



FASTER FINISHING

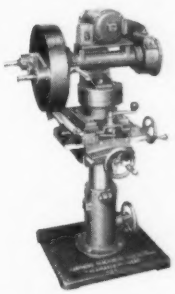
WITH

Hammond

STRAIT-LINE AUTOMATICS

ROTARY AUTOMATICS

JUNIOR AUTOMATICS



There are ten new Junior Automatics in the Hammond Line, to be used with polishing or buffing wheels or with abrasive belts. Model E2PF shown.

Users of Hammond Automatics report 2000 pieces or more per hour, more uniform, better finishing, less operator fatigue and specially, *lower costs.*

SEND SAMPLES: Send us one finished and several rough samples. You will receive a complete Engineering Report and Production Analysis without obligation.

Hammond of KALAMAZOO

Good Machinery Since '82

Hammond Machinery Builders INC.

1601 DOUGLAS AVENUE ★ KALAMAZOO, MICHIGAN, U. S. A.

DU-LITE

HAS DEVELOPED TWO HIGHLY EFFICIENT, ECONOMICAL CLEANERS

No. 72 For Die Castings and all parts of aluminum, zinc, and other soft metals. As a degreaser and for all surface cleaning prior to plating, chemical finishing or painting. Will not harm, etch or stain soft metals while maintaining highest cleaning efficiency. 10¢ a pound in 375-pound drums.

No. 28 For parts of Steel, Brass and Zinc. A superb cleaner which can be used either as soak or electrolytic. An exclusive Du-Lite development, compound with six cleaning properties including 2 wetting agents, also a very active rust inhibitor. Widely used by leading plants for cleaning prior to cadmium, nickel, and chrome plating. Economical in use and in price — 8½¢ a pound in 500-pound drums.

Du-Lite has had wide experience in experimenting with and developing cleaners for use in conjunction with the Du-Lite Black Finishing Process. No. 72 and No. 28 will meet every need for metal cleaning. Write us about your particular problem or, better still, send us your parts and we will process and recommend proper procedure.

THE DU-LITE CHEMICAL CORPORATION

110 RIVER ROAD — MIDDLETOWN, CONNECTICUT

DO IT RIGHT WITH DU-LITE

Acid Resistant Sponge

Barco Sales Co., Dept. MF, 174 Fifth Ave., New York 10, N. Y.

A new, all plastic sponge, which is not affected by mild acids, alkalies, washing compounds or soaps, has been developed by this firm.

The sponge is said to be extremely durable, and will give four to five times the wear of cellulose or natural sponges. It is white, velvet-like in texture when wet, and wipes dry like a chamois. The Barco plastic sponge is highly absorbent, and may be boiled or sterilized without changing its physical properties, according to the firm.

The sponge is individually wrapped in cellophane, and is available in two sizes: Large—6½ x 4 x 2½; Small—6 x 3¾ x 2.

Prices and additional information may be obtained from the above firm.

Improved Magna-Sight Flow Gauge

Fischer & Porter Co., Dept. MF, County Line Rd., Hatboro, Pa.

A completely redesigned Magna-sight flow gauge is announced by the above firm. The unit consists of a short body, with flanged or screwed pipe connections, which accommodates a fixed orifice in the lower end. A tapered metering plug rises and falls with fluid flow rate in accordance with variable-area metering principles. The metering plug carries a permanent magnet, and a hollow, cylindrical, soft iron follower rides in an external slot.

Covering the slot is a plate on which is engraved a scale calibrated either in gallons per minute or in millimeters. The position of the follower relative to the scale indicates flow rate.

The Magna-Sight flow gauge is available in brass, bronze, iron, steel and type 316 stainless steel; in sizes from ¾" to 4", and with maximum capacities from 3.5 to 250 gallons per minute. (Minimum capacity is one-tenth of selected maximum). The flow gauge can be used for clear and opaque liquids, slurries and other fluids, and accuracy averages about 5% over the scale range, it is claimed. Temperatures up to 400° F. and pressures up to 500 psig can be accommodated, according to the firm.

Combination Air Regulator and Filter

C. A. Norgren Co., Dept. MF, 222 Santa Fe Drive, Denver 9, Colo.

Only 11" high, the new Norgren filter-regulator combines filtering and pressure regulating in one compact unit—not an assembly. It is designed for use with air and any non-corrosive gas at pressure up to 125 p.s.i. and ambient temperatures up to 120° F.

It is recommended as original equipment on production machines and as plant equipment for spray painting lines, for instrument control and general industrial air line use.

The filter has directional inlet which creates centrifugal action throwing moisture and entrained solids against bowl, where they run down into a quiet zone beneath the baffle. Screen of reinforced 200-mesh monel wire removes remaining solids. The cylindrical screen has a surface area

ten times that of pipe opening, reducing air velocity and improving filtering results with longer periods between cleanings it is claimed. Has no moving parts—and no "cartridges" to replace. Bowl is fully transparent, showing filtering action, condition of air line, and amount of collected moisture.

Regulator performance exceeds that of larger, more costly types having larger diaphragms and valve ports, according to the firm. Greater air flow with *less pressure drop* than other regulators of equal size diaphragm, ports, etc., is assured because of baffle plate and siphon tube action. Regulator responds faster to sudden demands for large volume, without excessive momentary pressure drop, it is claimed.

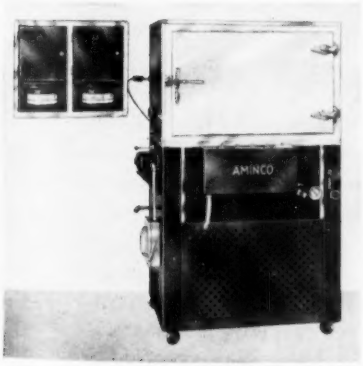
Entire unit is easily installed in-line pipe connections and easily dismantled without removing from line. For additional information write the manufacturer.

Humidity-Temperature Test Apparatus With Program Control

American Instrument Co., Inc., Dept., MF, 8030-8050 Georgia Ave., Silver Spring, Md.

Precisely controlled variations of humidity and temperature can be repeated periodically, according to a predetermined program, by means of a new versatile test apparatus recently announced by the above company.

Standard apparatus provides three humidity-temperature program schedules of interest to government laboratories and manufacturers supplying



equipment to the government, namely: (1) U. S. Signal Corps Standard Cycle No. SC-D-16286-B (except for the sub-zero phase); (2) U. S. Navy Specifications JAN-M-745; (3) U. S. Signal Corps Standard Cycle No. ES-D-65103-A (except for the sub-zero phase). Apparatus for other program schedules is available.

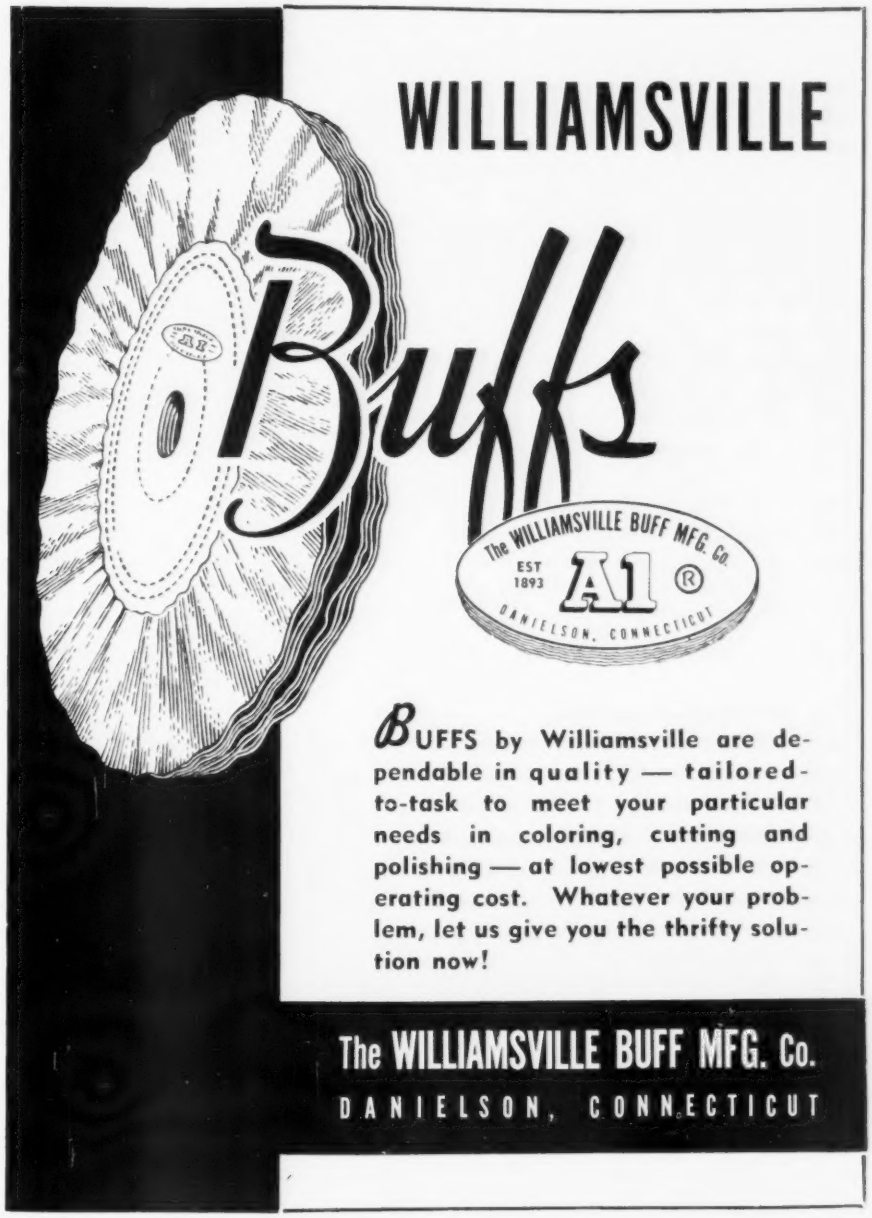
The apparatus consists of a test chamber, an air-conditioning unit, and a special control system.

Average maximum rate of rise of dew-point temperature (between 60° and 160° F.) is plus 0.45° F. per minute, without load.

Average maximum rate of fall of dew-point temperature (between 60° and 160°F.) is minus 0.75° F. per minute, without load.

Average maximum rates of rise and fall of dry-bulb temperature is equal to or greater in magnitude than for dew-point temperature.

Details are given in manufacturer's Bulletin 2176, which is available upon request.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Buffs
A1
The WILLIAMSVILLE BUFF MFG. Co.
EST 1893
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DANIELSON, CONNECTICUT
BUFFS by Williamsville are dependable in quality — tailored-to-task to meet your particular needs in coloring, cutting and polishing — at lowest possible operating cost. Whatever your problem, let us give you the thrifty solution now!
The WILLIAMSVILLE BUFF MFG. Co.
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pH Electrodes Feature Waterproof Design

Leeds & Northrup Company, Dept. MF, 4934 Stenton Ave., Philadelphia 44, Pa.

Two new pH electrode assemblies for use with L&N Recorders and Controllers just announced by this firm feature waterproof design. One assembly is for continuous sampling lines; the other for immersion in open channels and tanks.

The sampling line assembly has low capacity which permits a high flow rate and minimizes the coating of electrodes by suspended material. Operating pressure can be up to 15 pounds. Body of the assembly is a single block of clear plastic, $4\frac{1}{4}$" x $1\frac{3}{8}$" x $4\frac{3}{4}$". Inlet and outlet connections fit standard $\frac{1}{4}$" pipe.

PATENTS

Electrodepositing Lead on Copper from a Nitrate Bath

U. S. Patent 2,485,258. *T. S. Chambers, and O. C. Slotterbeck, assignors to Standard Oil Development Co.*

A process for preparing cathodes suitable for the electrolytic reduction of organic compounds which comprises electrolytically depositing a thin film of lead weighing between about 0.02 and 0.5 gram per square dm. on copper from an aqueous electrolyte consisting essentially of 100 grams per liter of lead nitrate and from 1 to about 20 grams per liter of cupric nitrate at a current density of about one ampere per square dm.

Corrosion Prevention

U. S. Patent 2,485,309. *L. G. Nunn, Jr., assignor to Standard Oil Development Co.*

A method for inhibiting corrosion of ferrous metal in contact with an aqueous fluid containing hydrogen sulphide which comprises incorporating in the aqueous fluid a methylol melamine condensation product which is at least capable of being colloidally suspended in said aqueous fluid, said condensation product being used in a small but sufficient quantity to inhibit said corrosion.

Composition for Descaling Ferrous Metal Surfaces

U. S. Patent 2,485,528. *P. H. Cardwell and G. E. Mullin, assignors to The Dow Chemical Co.*

A composition for descaling a ferrous metal surface comprising an aqueous solution containing from about 5 to 25 per cent of HCl, from about 0.1 to 1 per cent of an organic nitrogen base soluble in hydrochloric acid selected from the group consisting of the aromatic and heterocyclic nitrogen bases, and from about 0.1 to 2 per cent of a water-soluble thiocyanate.

Composition for Removing Scale from Ferrous Metal Surfaces

U. S. Patent 2,485,529. *P. H. Cardwell and G. E. Mullin, assignors to The Dow Chemical Co.*

A composition for descaling a ferrous metal surface comprising an aqueous solution containing by weight from about 5 to 25 per cent of HCl, from about 0.002 to 1 per cent of a corrosion-modifying agent selected from the group consisting of urea, thiourea, diethylthiourea, diisopropylthiourea, dibutylthiourea, ethylenethiourea, sym.-di-o-tolylthiourea, sym.-di-p-tolylthiourea, and sym.-diphenylthiourea, and from 0.1 to 2.0 per cent of a water-soluble inorganic thiocyanate.

Cleaning Composition

U. S. Patent 2,485,554. *R. Bernstein.*

A solvent-emulsion cleaner consisting essentially of a substantially homogeneous mixture of the following proportions by weight: between about 9.5 and 10.5 percent tall oil, between about 13.0 and 14.5 percent pine oil, between about 1.5 and 2.0 percent potassium carbonate, between about 0.5 and 1.1 percent sodium chromate, between 5.0 and 20.0 percent water, and a balance of kerosene to make 100 percent.

Aluminum Plating Process

U. S. Patent 2,485,182. *A. Arent, assignor to Arthur Arent Laboratories, Inc.*

The method of cold plating aluminum-containing metals, which comprises wetting the surface of such a metal with the solution reaction product of the intermixture of anhydrous antimony trichloride with a brine selected from a group consisting of sodium chloride, potassium chloride, and calcium chloride brines for an interval sufficient to induce a surface reaction in which metallic antimony forms on the aluminum surface in commingling union therewith.

Sandblast Gun

U. S. Patent 2,487,366. *G. J. Penno, assignor to Tornado Mfg. Co., Inc.*

A gun for spraying fluids and blasting with abrasives, comprising: a substantially horizontal body portion; means for supplying air under control into the rearward extremity of said body portion; an air passage in said body portion; a nozzle tube bore extending into the forward extremity of said body portion in alignment with and communicating with said air passage, said bore being of larger diameter than said air passage; a feed passage opening through the bottom of said bore; means for supplying material to said fed passage; an air jet member positioned in the rearward extremity of said bore between said feed passage and said air passage; a nozzle tube positioned in the forward extremity of said bore and fitted to said air jet at its rearward extremity, said nozzle tube having an opening in its bottom wall communicating with said feed passage; a peripheral receiving groove in said nozzle tube forwardly of said body portion; a U-shaped locking disc fitted into said groove; and means for clamping said disc to said body portion to lock said nozzle tube in place.

High Speed Zinc Plating

U. S. Patent 2,485,563. *A. E. Chester, and F. F. Reisinger, assignors to Poor & Co.*

The method of depositing zinc which comprises electrodepositing zinc from an aqueous alkaline cyanide-zinc plating bath containing a sufficient amount of dissolved zinc-aldonate to enhance the speed of deposit.

Cadmium Plating Addition Agent

U. S. Patent 2,485,565. *A. E. Chester and F. F. Reisinger, assignors to Poor & Co.*

An aqueous cyanide-cadmium plating bath comprising a cyanide-cadmium electrolyte and an amine salt of an aldonic acid.

In the electrodeposition of cadmium, the step which comprises electrodepositing cadmium from an aqueous cyanide-cadmium plating bath having dissolved therein an amine salt of an aldonic acid.

Rectifier and Method of Making the Same

U. S. Patent 2,485,593. *L. B. Haigh, assignor to Federal Telephone & Radio Corp.*

A rectifier comprising, in combination, a metallic base plate, a selenium layer on said base plate, an insulating layer supported on said base plate and having an opening therethrough exposing a relatively small area of selenium, a lead wire supported on said insulation, a portion of said wire passing over said opening, a second layer of insulation above said lead wire and having an opening therethrough substantially coaxial with the opening in

the first insulating layer, a counter-electrode alloy extending through said two openings, about said lead wire and to said selenium layer, and integral extensions on said base plate bent upwardly and over the second insulating layer to hold all the parts together as an integral unit.

Coated Abrasives

U. S. Patent 2,485,765. *N. E. Oglesby.*

In the manufacture of coated abrasives having a cellulosic backing, a coat of abrasive grit held thereto by a making coat of animal glue in the form of a layer adjacent the backing and a sizing coat of synthetic resin in the form of a layer applied over the grains, the step, after the coats have been applied, the said glue making coat has been dried and the said resinous sizing coat has been at least partially cured, of swelling the backing by application thereto of an aqueous medium and thereafter drying to shrink the backing sufficiently to produce a backing the outer surface of which is of such dimensions in relation to the outer surface adhesive-abrasive coating dimensions that it will not under average conditions of use absorb sufficient moisture from the atmosphere to curl the article and present a concave abrasive surface, thereby forming a coated abrasive having a grit surface character substantially flat to convex curl under average conditions of use, whereby a concave grit surface is avoided.

Phosphate Coatings on Iron, Zinc, and Aluminum

U. S. Patent 2,487,137. *G. R. Hoover and N. Cox, assignors to Armco Steel Corp.*

A process of producing substantially fluorine-free phosphate coating on iron, zinc and aluminum surfaces, which comprises immersing articles having such surfaces in a solution consisting essentially of an oxidizing agent adapted to remove hydrogen in the process and equivalent to .30% to 2.65% nitrate, fluorine, and an acid phosphate of a metal which will deposit as a phosphate coating, water being the solvent, said solution having a ratio of free acid to total acid of 1:2 to 1:10, a free acid content from substantially 1.5 to 10 points, a total acid content from substantially 16.0 to 65 points, and in which the fluorine in the solution results from the addition of a material from the class consisting of hydrofluoric acid and its salts, the amount of fluorine present being substantially 0.015% to 0.80% by weight, maintaining said solution at temperatures between substantially 120° and substantially 210° F., and withdrawing the articles from said solution after a treatment time of substantially 5 seconds to substantially 1 minute.

Continuous Electrolytic Purification Plating Tank

U. S. Patent 2,487,399. *A. E. Thurber, assignor to Oneida, Ltd.*

Electroplating apparatus comprising a cathodic cell, an anodic cell, a porous membrane separating the said cells, means for circulating electrolyte to and from said anodic cell and purifying the same during such circulation, comprising an outlet connection from the bottom of the said anodic cell and a first tank for receiving electrolyte from said anodic cell and having an overflow to maintain the level in said tank and said anodic cell below the top of said membrane, a second tank for discharging electorlyte into said cathodic cell and having an overflow to maintain the level in said second tank and cathodic cell above the top of said membrane for causing overflow from said cathodic cell into said anodic cell, and means for maintaining a flow of electrolyte from said first tank to said second tank.

Stainless Steel Picklng

U. S. Patent 2,488,108. *F. C. Abbott, assignor to The Pennsylvania Salt Mfg. Co.*

A composition suitable for use in aqueous acid solution for the pickling of stainless steel, comprising a chlorate capable of furnishing chlorate ions in aqueous acid solution, and a fluoride salt capable of furnishing fluoride ions in aqueous acid solution, the chlorate and the fluoride being present in the composition in such proportion that from .02 to 40 parts by weight chlorate ion are furnished per part by weight of fluoride ion in aqueous acid solution.

Degreasing Machine

U. S. Patent 2,488,156. *J. G. Bamberger.*

A degreasing machine comprising a receptacle having a bottom, said bottom being shaped to provide an inclined trough which is substantially V-shaped in cross section, a sludge tank communicating with the lower end of said trough, said trough and sludge tank being adapted to receive a degreasing solvent, means for applying heat to said inclined trough to vaporize a degreasing solvent therein, and means including a gravity feed pipe for delivering condensate from the upper portion of the receptacle, the discharge end of said pipe being located at the upper end of said trough near the botom surface thereof.

Bright Zinc Plating In Pyrophosphate Baths

U. S. Patent 2,488,246. *J. E. Stareck and F. Passalacqua, assignors to United Chromium, Inc.*

An aqueous bath for electroplating zinc, consisting essentially of pyrophosphate radicals and zinc in the molecular ratio of approximately 2.3 to 1 to 4.6 to 1, and optimum amounts of approximately ½ to 3 g./l. of ortho-hydroxy meta methoxy benzaldehyde, acting as a brightener, and having a pH between 9.5 and 12.5.

Selenium Rectifier

U. S. Patent 2,488,369. *W. E. Blackburn, assignor to Westinghouse Electric Corp.*

The method of forming a blocking layer on selenium which comprises producing thereon a layer of cadmium sulphide.

Method for the Separation of Cobalt and Nickel from Solutions

U. S. Patent 2,488,561. *R. B. Schaal, assignor to Ferro Enamel Corp.*

The method of separating cobalt from a double chloride solution of cobalt and nickel which comprises: (*a*) chlorinating the solution, in the presence of a stoichiometric amount of calcium carbonate required to react with the hydrochloric acid produced, sufficiently to precipitate substantially all of the chlorides of cobalt and nickel present in the solution as the corresponding hydroxides, (*b*) further chlorinating to an extent sufficient to redissolve substantially all of the nickel hydroxide and only a minor amount of the cobalt hydroxide as the corresponding chlorides and with the production of free hydrochloric acid, and then (*c*) separating the remaining cobalt hydroxide from the solution.

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Business Items

Osborn Elects L. F. Miller V. P. for Machine Sales

The Osborn Mfg. Co., Cleveland, announces the election of *Leon F. Miller* as Vice President in Charge of Sales and Engineering of the company's Foundry Machinery Division.

Mr. Miller joined the company in January, 1929, after having attended Case Institute of Technology in Cleveland. For the last six years, he has been Sales Manager, and for ten years prior to that was Sales Engineer in Ohio and the Southern states.

Leon F. Miller

Mr. Miller brings to his new position a broad knowledge backed by over twenty years' experience in the application of moulding machinery to foundry production problems. He is a member and past director of the Cleveland Chapter of The American Foundrymen's Society.

Standard Plating Rack Appoints New Vice-President

Mr. Max Schneider, president of *Standard Plating Rack Co.* of Chicago, Ill., recently announced the appointment of *John Kurdenok* as vice president in charge of sales.

John Kurdenok

Mr. Kurdenok has been associated with the firm as plant superintendent for the past three years and will continue to be responsible for the company's production and special projects in plating rack development.

Mr. Kurdenok has had wide industrial experience in the plating industry with the *Houdaille Hershey Corp.*, *Chrysler Corp.* and *General Mills, Inc.*

This appointment is another step by the Standard Plating Rack Co. to provide the very best possible customer service.

J. R. Macon Joins Pennsalt

J. Ralph Macon has recently joined Pennsylvania Salt Manufacturing Co. as an engineer in the Market Research Division, it was announced by *George T. Collins*, manager of the division.

Mr. Macon, formerly associated with duPont's Electro-chemicals Department, will work on market development of new Pennsalt products for the metallurgical industry.

Miller Joins R. O. Hull Co.

R. O. Hull & Co., Inc., announces the addition to their Cleveland office of *Curtis Miller* in the position of Technical Representative. Mr. Miller enters his tenth year in electroplating since graduation in Chemical Engineering from Case Institute of Technology. He was formerly connected with United Chromium, McGean Chemical Co., and Chromium Corp. of

Curtis Miller

America. During the last war, he served four years with the Army Chemical Corps as a Technical Officer.

Mr. Miller will make available to metal finishers of the Northeastern Midwest the use of ROHCO addition agents, Hull Cell equipment and consulting service, as well as the Enthone products for which R. O. Hull & Co., Inc., are distributors.

Trailer Lock and Body Co. in New Quarters

The Trailer Lock & Body Co., manufacturers of work holding spinners for the metal finishing industry, recently announced that the executive offices and machine shop of the firm are now both located at larger quarters. The new address is 1301 *N. Larabee St., Chicago* 10, *Ill.*

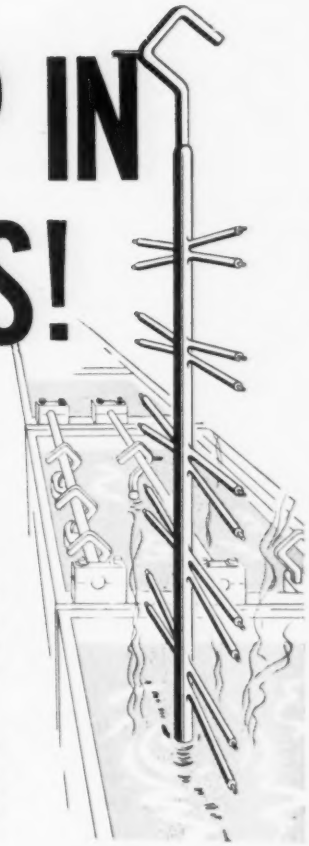
The new quarters offer larger space for meeting and increasing present production demand.

Two Executives Appointed at Duriron

Guy A. Baker has been appointed Vice President in charge of manufacturing for the Duriron Company, Inc., of Dayton, Ohio.

For several years Mr. Baker has

STANDS UP IN ALL CYCLES!



Outstanding rack protection achieved by plastisol Unichrome COATING 218X

No matter what you need in rack protective qualities, Coating 218X has it. Resistance to vapor degreasing? Coating 218X has that! Ability to stand up in hot cyanides or caustics? In chromium plating? Again 218X is the answer. And if it can withstand *those* plating operations, it will take them *all*.

In test runs at a well known plating plant, for example, Coating 218X was put through a cycle including soak cleaners, anodic alkaline cleaner, cyanide dip, acid dips, nickel plate, chromium plate and chromium strip. There was still no attack after *840 cycles*, at which time the attempt to break down Coating 218X was abandoned!

Physically, too, Coating 218X leads. It won't chip, resists cutting and abrasion, minimizes dragout. All in all, it's easy to see why your rack coating costs will hit bottom with Coating 218X. Write today for prices.

(NOTE: Applicators nearby can bake 218X onto your racks if you have no facilities for applying it. Ask for names.)

UNICHROME

Trade Mark

RACK COATINGS—Products of UNITED CHROMIUM, INCORPORATED • 51 E. 42nd St., New York 17, N.Y.

Detroit 20, Mich. • Waterbury 90, Conn. • Chicago 4, Ill. • Los Angeles 13, Cal.

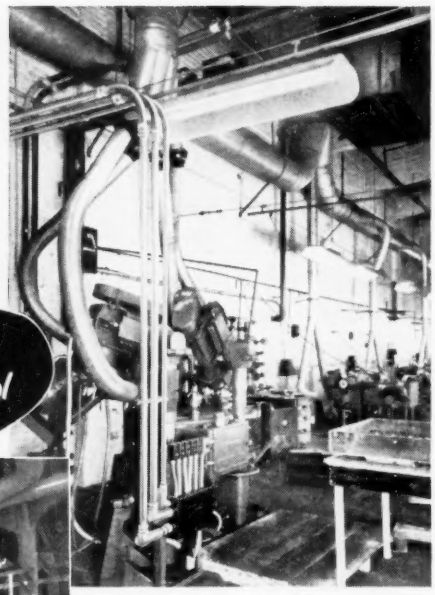
Guy A. Baker

R. Merton Shields

3 Problems— 1 Solution

...KIRK & BLUM!

Below: High velocity, double-slot hoods effectively pick up fumes as formed, remove them through corrosion resistant piping and exhausters.



Above: Dust Collecting System; note flexible connections permitting movement of automatic buffing and polishing machine. Below: Two-pass monorail conveyor through direct fired gas oven.

Illustrating Kirk and Blum's wide experience and money-saving ingenuity are these installations in the plant of a large auto accessories manufacturer. Three separate systems eliminate fumes from pickling and plating tanks, control dust in polishing and buffing operations and provide accurately controlled heat for enamel baking in a conveyorized overhead oven.

These are examples of the hundreds of systems designed, fabricated and installed by KIRK & BLUM. Turn your dust control, fume removal or low temperature oven problems over to experts with 40 years' experience.

FOR CLEAN AIR . . . THE INVISIBLE TOOL

KIRK AND BLUM

DUST AND FUME REMOVAL ● INDUSTRIAL OVENS

THE KIRK AND BLUM MANUFACTURING CO., 2859 SPRING GROVE AVE., CINCINNATI 25, OHIO

been Assistant to the President and Secretary of the Company. Prior to that he has been Manager of the Duriron Co.'s Alloy Castings Sales. During his twenty years association with the Duriron Company, Mr. Baker has been very active in metallurgical research and development. He is affiliated with numerous technical societies.

R. Merton Shields has been appointed secretary of the company. Mr. Shields is a Mechanical Engineer, a graduate of Michigan College of Mining and Technology and prior to his new appointment was manager of the Dayton District Sales. He has been with the company since 1936.

J. C. Miller Co. Moves Offices

The general offices of the *J. C. Miller Co.* have been moved to their production plant at 631 *Chestnut St., Grand Rapids, Mich.* The offices are now in completely modernized quarters, and the proximity with the production facilities is expected to result in increased efficiency in taking care of customers needs.

Electric Products Co. Apppoints New England Agents

The Electric Products Co., of Cleveland, O., have appointed the *J. J. Costello Co.* as their representatives in the New England States. With offices in Boston, Mass., and New Haven, Conn., the Costello Co. have seven Application Engineers covering the New England States.

The Electric Products Co. is a forty-year-old manufacturer of battery chargers; electrolytic motor-generators; general-purpose motor-generators; frequency changers; induction, direct-current and synchronous motors, and direct-current and synchronous generators.

Baker Bros. Form New Supply House

On Monday, January 16, 1950, *Baker Bros., Inc.*, commenced doing business at 142 *Oliver St., Boston, Mass.* This firm will be owned and operated by *Steven Baker* and *Robert Baker*, formerly of *M. E. Baker Co.*

They will carry a complete line of plating and polishing supplies as well as new and used plating and polishing equipment.

Their declared policy will be one of dependability, service, and personal interest in their customers' needs and problems, regardless of size.

Allied Research Expands Line

Among the new products announced recently by *Allied Research Products, Inc.*, Baltimore, are a powder form of an Iridite coating for the corrosion protection of zinc and cadmium, a new Iridite finish for aluminum and a radically new type of organic brightener for zinc plating solutions.

The new products were introduced to the sales-engineering staff at a three day sales meeting held in Baltimore. At the same time a preview of the research program for the development of new products was presented to the group.

Iridite #8-P, the new powdered Iridite, is said to achieve appreciable savings in shipping costs and eliminates the need for returnable packaging.

The new finish for aluminum, Iridite Alcote, provides corrosion resistance, paint adherence characteristics and abrasion resistance believed unobtainable with other chemical dip aluminum finishing processes.

The zinc plate brightener compound will be called ARP #3 and will be supplied in liquid form for use in any type of zinc plating bath. It is claimed that the new brightener produces better results at lower cost than established materials now on the market.

Production Machine Co. to Exhibit

The Production Machine Co., of *Greenfield, Mass.*, manufacturers of

centerless polishing and abrasive belt surfacing machines, will exhibit their Centerless Feed polishing equipment at the forthcoming Tool Engineers Industrial Exposition, which is being held in Philadelphia from April 10-14. Their exhibit will be in Booth 1042.

Circo Products Co. Announces Executive Changes

On January 13, at a Board meeting, *Mr. John F. Black* announced his resignation as President and Director of Circo Products Co., manufacturer of industrial and automotive vapor degreasing equipment.

Mr. Joseph W. Powell, Jr., Vice President of the American Research and Development Corp., of Boston, was elected President of Circo at the same meeting, and *Mr. Fenton M. Davison*, Vice President, has been placed in charge of all operations of the Company.

New general offices of the company have been opened at 6531 *Euclid Avenue, Cleveland 3, O.* Due to the unrelated methods of manufacture of Circo's two major cleaning equipment lines, the Company will operate its main plant at 1965 East 66th Street in Cleveland for the manufacture and servicing of its Dee-Tee equipment. Manufacturing facilities have been secured on the west side of the city for the breaking, welding and complete assembly of the large degreasers for all types of metal cleaning.

This specialization of manufacturing operations will better enable Circo to meet the growing demand for vapor degreasing equipment.

New Producer of Chromic Acid

Better Finishes and Coatings, Inc., Newark 5, N. J., is now shipping Chromic Acid Flake, Technical Grade, produced in newly installed electro-chemical equipment at its Newark plant. The company claims that analyses by independent testing laboratories indicate that the new production is low in chlorides, sulphate and insolubles and exceeds U. S. Government Specification AN-A-21.

Chromic acid production is the first of a series of steps being made by Better Finishes & Coatings, Inc., to expand its line of finishes, peelable plastic coatings, stop-off and masking compounds, etc., being made for the organic finishing, electroplating and metal-working industries.

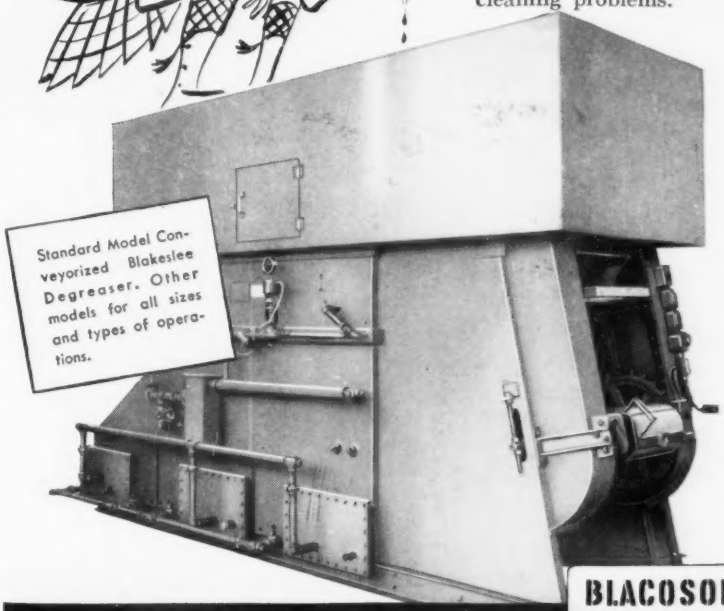
BLAKESLEE

SOLVENT VAPOR DEGREASERS

USE LESS SOLVENT

And that's not all . . . In Blakeslee Solvent Vapor Degreasers, metal parts are rendered chemically clean and dry in just a few seconds. Cracks and spot welded seams come out 100% grease-free. This means savings in time, labor and rejects.

Blakeslee, pioneer in mass production cleaning methods, is the logical source to answer your cleaning problems.



Standard Model Conveyorized Blakeslee Degreaser. Other models for all sizes and types of operations.

G. S. BLAKESLEE & CO.

BLACOSOLV DEGREASERS AND SOLVENT

NIAGARA METAL PARTS WASHERS

G. S. BLAKESLEE CO., CHICAGO 50, ILLINOIS
NEW YORK, N.Y. TORONTO, ONT.

"Lektron" Trade Mark Registered

Electronic Rectifiers, Inc., Indianapolis, Ind., have announced the registration of their trade mark, "Lektron" for electrical rectifiers. This is the trade name for their line of magnesium-copper sulphide dry disc rectifiers. "Lektron" rectifiers use magnesium radiator plates to reduce weight and give improved heat dissipation.

H. C. Land Named Pennsalt Production Manager

Hugh C. Land, former assistant to the production manager of the Pennsylvania Salt Mfg. Co., has been appointed production manager. In his new capacity Mr. Land will exercise general supervision over operation of the manufacturing facilities in the parent company, including utilities.

Mr. Land received his degree of Bachelor of Science in Chemical Engineering at the University of Denver. Following his graduation he joined a consulting engineering firm in Denver as resident engineer on various construction jobs. He later joined the Maclear Mfg. Co., of Denver, as assistant general manager.

During the war Mr. Land served as a civilian engineer with the Chemical Warfare Service at the Rocky Mountain Arsenal near Denver. He was chief of the maintenance division when he resigned in 1946 to join the Pennsylvania Salt Mfg. Co. at Wyandotte. At this plant he was in charge of maintenance and later was named assistant superintendent.

NO SHUT DOWN

to carbon treat solution with . . .

horizontal

SPARKLER *plate* FILTERS

SPARKLER horizontal plate FILTERS

Only a few minutes are required to lift out the horizontal plate assembly in a Sparkler Filter and drop in a clean set of filter plates and production is under way without appreciable interruption.

Tanks are given a carbon treatment without shutting down production in the battery installation shown here. One or two filters are cut out of the line, drained, cleaned and dressed with clean filter papers. The proper amount of carbon is mixed with water in a stand-by tank and recirculated through the filters thus depositing the carbon on the plates in a cake of uniform thickness and density. The solution requiring a carbon treatment is then circulated through the carbon beds giving the plating solution the carbon treatment without contaminating the tank or stopping plating operations.

Sparkler Horizontal Plate filters give absolutely sharp filtration at all stages of the cycle.

A battery of 18 Sparkler Filters in one of the largest bright nickel plating plants in the world.

SPARKLER
MANUFACTURING CO.
MUNDELEIN, ILLINOIS

Allied Research Buys Hoffman Co.

As part of an expansion program to increase the company's line of metal finishing chemicals, *Allied Research Products, Inc.*, of Baltimore, has purchased the R. A. Hoffman Chemical Co., of Cleveland, Ohio.

In announcing this acquisition, *H. C. Irvin*, President of Allied Research said that *R. A. Hoffman*, formerly owner of the Hoffman Company, has joined Allied Research and will be in charge of the development of new types of organic finishes.

For the present, Allied Research will maintain Mr. Hoffman's former research laboratory at 224 High Street, Cleveland, as a branch of their Baltimore research division. However, his activities will be transferred to Baltimore when new laboratories have been completed at the Allied Research plant.

Staley New Sales Manager for Duriron

Wayne D. Staley, formerly New York District Manager for The Duriron Co., has been appointed General Sales Manager and will be located at the home office of the company in Dayton, Ohio. In directing sales and advertising activities, he will replace *D. E. Jack*, who has resigned as Vice President in charge of Engineering and Sales.

R. F. Sharpe, former manager of the Philadelphia office, has been appointed New York District Manager.

Ralph L. Watts, who was formerly Sales Engineer in New York, will be in charge of the Philadelphia office.

Lindahl Now a Fleet Admiral

Mr. L. K. Lindahl, president of The Udylite Corp., manufacturers of metal finishing equipment, was recently commissioned "Admiral of the Flagship Fleet," an honorary organization sponsored by American Airlines.

Presentation of a certificate signifying Mr. Lindahl's appointment was made by Brigadier General *L. G. Fritz*, Vice-President in Charge of Operation, American Airlines. The ceremony took place following a luncheon at Detroit's Recess Club honoring Mr. Lindahl.

Wm. Streaker Joins Atlas Mineral Products

George L. Wirtz, President of The Atlas Mineral Products Co. has announced that *Mr. William A. Streaker*, a recent graduate of the University of Illinois has joined The Atlas Mineral Products Co. as a Chemical Engineer.

Hampson New Pennsalt Chicago Manager

John C. Hampson, former Indiana field representative for the Pennsylvania Salt Mfg. Co.'s Special Chemicals Department, has been named sales manager for the department's newly-formed Chicago district, it was announced recently by *Joseph J. Duffy, Jr.*, departmental manager of sales.

The new sales district, with offices at 20 *N. Wacker Drive, Chicago*, will include the present Wisconsin, Illinois, Indiana and Missouri territories.

Mr. Hampson joined Pennsalt in 1936 as a salesman for the B-K and Household Products Dept. In January 1943 he transferred to Special Chemicals and since then has been working out of Indianapolis.

American Air Filter Merges With Herman Nelson Corp.

The merger of *American Air Filter Co., Inc., Louisville, Ky.*, well-known manufacturer of air filters and dust collectors, and *Herman Nelson Corp., Moline, Ill.*, one of the oldest names in heating and ventilating equipment, became effective as of January 6, 1950, according to an announcement made by *W. M. Reed*, president of the American Air Filter Co., surviving corporation.

The Nelson Corporation henceforth will be operated as the Herman Nelson Div. of American Air Filter Co., Inc., and will continue to maintain its headquarters and facilities in Moline. The merger company's principal offices and headquarters will be in Louisville, Ky.

W. G. Frank, executive vice-president and *Richard H. Nelson* have been elected directors of the combined firm. Richard H. Nelson and *Robert W. Nelson* have been elected vice-presidents of the enlarged firm and *E. G. Mason*, of the Herman Nelson Div. has been elected assistant secretary and assistant treasurer.

Acheson Colloids Elects New Officers

Acheson Colloids Corp., Port Huron, Mich., manufacturers of colloidal dispersions, announced today the election of three new vice presidents.

P. C. Buck becomes Vice President in Charge of Production; *M. W. Reynolds*, Vice President in Charge of Sales; and *Raymond Szymanowitz*, Vice President in Charge of Research.

Buck, Szymanowitz and Reynolds are all veterans of the Acheson organization, having been with the company for 30, 25 and 24 years, respectively. Mr. Reynolds and Mr. Buck have their headquarters at the home office of the company in Port Huron, while Mr. Szymanowitz is located at the company's laboratories in Newark, New Jersey.

Roto-Finish Occupies New Quarters in Kalamazoo

The Roto-Finish Co. has transferred their operations from Sturgis, Mich., to their new factory at Kalamazoo, Mich. This modern plant embodies all the manufacturing facilities for producing Roto-Finish equipment and supplies.

One of the many outstanding features of the new plant is the sample processing department which is located in a specially designed area 25' wide by 80' long. The floor is built for proper drainage and all material handling is by an overhanging bridge crane system which services the complete installation. All models of Roto-Finish equipment and supplies are used in this department in order to demonstrate the processes under ideal conditions and as nearly as possible like actual plant production operation. Prospective users parts are finished in this department. The sample processing department also has several new experimental machines which are constantly being used in the development of improved finishing methods. The sample processing office is used as a

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99.75% PURE
SODIUM BICHROMATE
POTASSIUM BICHROMATE
MUTUAL CHEMICAL CO. OF AMERICA
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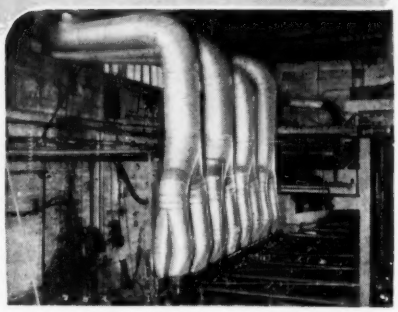
Ohio FUME AND DUST REMOVAL SYSTEMS

TANGIBLE DOLLAR SAVERS

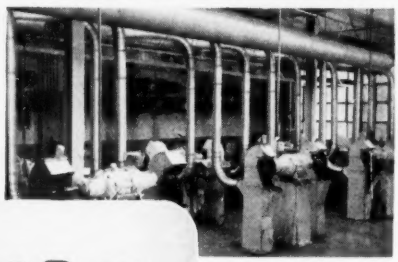
● Records on hundreds of Ohio Blow Pipe jobs prove without question that production output materially increased and employee absence and complaints radically decreased after the installation of an Ohio System for ventilation of fumes from plating and rinse tanks and dust collection from grinding, polishing and buffing.

Ohio Systems are not standard fit-all systems. They are designed and engineered to meet your individual requirements. Ohio engineers, thoroughly experienced in their field, make a careful, exacting survey of your plant and an analysis of conditions and then plan the system that will meet most efficiently your special needs and conditions.

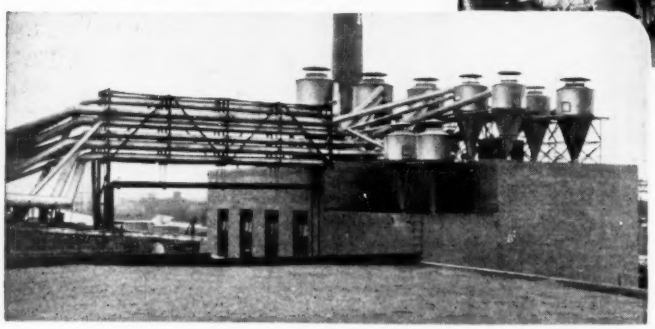
Call, write or phone today and let Ohio engineers make a survey and give you, without obligation, an estimate.



Fumes Removal Installation in Plating Room



Dust Collecting System for Buffing Machines



Cyclone Type Dust Collectors

Ohio BLOW PIPE CO.

ENGINEERS AND MANUFACTURERS

1725 DOAN AVENUE • CLEVELAND 12, OHIO

place for registration of incoming work, record data, issuing reports on the work actually done for prospective customers. Complete records are kept on all work processed.

Adjacent to the sample processing department is an ultra modern experimental laboratory used for development work, under the direction of engineers and chemists.

In addition to these facilities, an engineering department is maintained for the development of new Roto-Finish equipment for customer service.

The remainder of the new plant is divided into executive offices, administrative offices, accounting, etc. Ample space has been allowed with loading docks, manufacturing areas, etc.

3M Co. Purchases Additional Space

The Minnesota Mining & Manufacturing Co. has purchased 26,000 square feet of additional office and warehouse space in Detroit, Mich., according to an announcement from the firm's headquarters here. Two buildings and nearly four acres of land are included in the property.

The company operates an adhesives and coatings plant at 411 Piquette Ave. which also houses the Detroit branch sales offices and warehouse facilities. Moving the branch unit to the new quarters at 8825 *Grinnell Ave.* will make more manufacturing space available in the adhesives plant, it was pointed out. Sixty persons will be transferred to the Grinnell address March 1.

One structure, containing about 22,000 square feet of floor area, will house the branch offices and serve as a warehouse. The smaller building will provide some additional storage space. Both are of steel and brick construction. The property is served by a spur rail track and equipped with an enclosed truck-level loading dock. It formerly belonged to the Ternes Steel Co.

Huddleston Elected to Board at Parker Rust Proof

Clarence J. Huddleston was recently elected a director of the *Parker Rust Proof Co.* He will take the place of the late Albert Foster. *Mr. Robert Englehart* was also elected executive vice president of the firm.

Letter to the Editor

Removing Carbonates from Cyanide Baths

Dear Editor:

With reference to the excellent article of Mr. H. F. Ross on carbonate removal from cyanide plating solutions, published in your July, 1949 issue and an interesting letter exchange between Mr. Ross and Mr. Vendryes in the January, 1950 issue, I would like to register one comment.

In zinc cyanide plating solutions it is good practice to keep a small quantity of alkali metal sulfide in solution, to insure instant purification of heavy metal impurities and maintain bright plating (an exception is the du Pont "Duozinc" solution). The sulfide requirement can be furnished in the form of Calcium Polysulfide (a proprietary compound containing this chemical is marketed under the name "Zinc-Brite"). In this case the Calcium ion automatically serves as a carbonate remover, while the sulfides act as purifiers. Normally the carbonate content in a zinc plating solution can be kept in this system constantly at the optimum (4-6 oz./gal.) and no other treatment is needed.

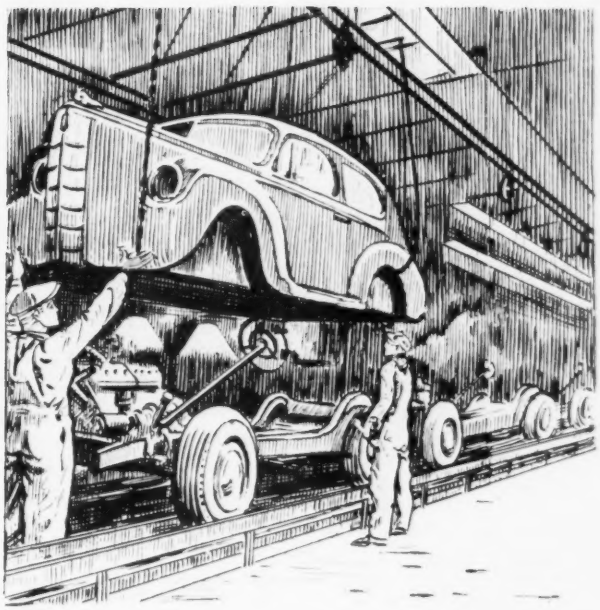
I want to take this opportunity to express my appreciation for the high level your publication has kept. It is an outstanding contribution towards progress in the industry.

Very truly yours,

LESLIE E. LANCY, Ph.D.
Consultant

MOTOR CITY PLATING NEWS

by Edward Finne



Douglas & Lomason Co., 5836 Lincoln, Detroit, producers of automotive mouldings, have recently enlarged their plating department to include flash chromium plating of their stainless steel products. *Eugene Girard* has joined the organization and has charge of the plating operations.

Frank Clifton, secretary-treasurer of the Detroit branch of the A.E.S. reports that he is completely recovered from his collapse at the annual Detroit branch Educational session last December.

United Chromium, Inc., has taken a long term lease on a new building of approximately 17,000 square feet at 1700 East Nine Mile Road, Ferndale, Mich. All laboratory facilities, pilot plant plating equipment and offices will be moved from the present Detroit headquarters at 2751 East Jefferson Ave. to the new plant as soon as construction of the building is completed.

Robert I. Carlson, formerly of the Detroit Lubricator Co., has joined the staff of Edgar Hahn, chief metallurgist at Lyon, Inc., 13881 W. Chicago Blvd., Detroit. Carlson will function as shift supervisor and chemist on plating operations.

Mt. Clemens Metal Products Co., South Rose St., Mt. Clemens, Mich., have installed a new barrel plating room for zinc plating their manufactured parts. *J. O. Sargent*, formerly of Motor State Products Co., Ypsilanti, Mich., is the new finishing foreman.

Use of *rock salt for de-icing streets* won strong support from a special committee of the Engineering Society of Detroit. The committee declared that "there is no real evidence that use of rock salt for ice control has any material effect upon the corrosion of automobiles." "Abrasion and the presence of moisture, with or without salt content, are the prime factors in accelerating corrosion," the committee added. Rock salt, it was pointed out, has been blamed for much corrosion which was really the result of numerous causes. The presence of chlorine and sulfuric acid fumes in the Detroit area cause comparatively rapid deterioration of chrome plated parts, the committee said.

The committee recommended several methods to reduce corrosion:

1—Have a heavy undercoating applied to the chassis and undercarriage.

2—Wax a new automobile during the third or fourth week of ownership. Liquid wax is preferable for chrome in order to reach the bottom of minute cracks.

3—Rewax every two or three months to eliminate the need for a cleaner, which will remove a part of the finish.

4—Touch up chipped or scratched areas at once where metal is exposed.

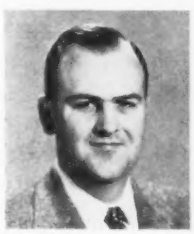
5—Unless exposure to salt is frequent or severe, do not wash frequently in winter, for such washing removes the wax.

The committee's findings were reported in detail in the January issue of the Society's publication, *The Foundation*.

The Detroit section of the *Electrochemical Society* held its January meeting in conjunction with the Detroit branch of the American Electroplaters Society. The AES invited the members of the Electrochemical Society to hear *Dr. Louis Weisberg's* talk on *Polarization and Related Phenomena*.

Appointment of *Walter A. Bayer* and *William F. Clemons* to the Detroit district sales staff of the Udylite Corp. was announced by L. V. Nagle, Vice-President in Charge of Sales. Both men were employed by Udylite in other capacities prior to their sales appointments.

Mr. Bayer has been with the Estimating Dept. of the Udylite Corp. since 1946 and Mr. Clemons was a control chemist in the firm's laboratories for two years. Both men are native Detroiters. Mr. Bayer graduated from the University of Detroit in 1942, and Mr. Clemons received his chemical engineering degree in 1948 from Lawrence Institute of Technology.



W. A. Bayer

W. F. Clemons

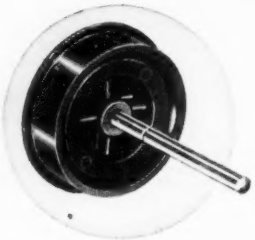
McGean Chemical Co., Cleveland, Ohio, has appointed *William Hopkins*

BLACK MAGIC

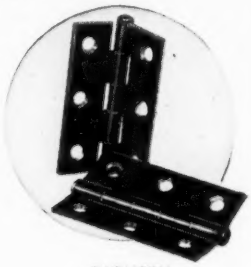
ECONOMICAL . . ATTRACTIVE . . PROTECTIVE CHEMICAL FINISHES

FOR FERROUS AND NONFERROUS METALS

STEEL



ZINC



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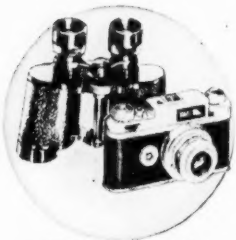
ONE BATH PROCESSES

SIMPLE TO OPERATE—ECONOMICAL TO USE

1. BLACK MAGIC Processes afford a rich, permanent black finish integral with the metal surface; will not chip, flake or peel.
2. Resistant to heat and thermal shock.
3. No dimensional change.
4. Sales appeal and service life.
5. Optical black finish.



COPPER & BRASS

HEAT TREATING MATERIALS

QUICK-CARB, No. 20—No. 40—No. 60, Liquid Bath Carburizing Salts.
QUICK-TEMPER TEMPERING AND DRAWING SALTS—275° F. and 420° F. Melting Points.
NEUTRAL SALTS—For Complete Range of Temperature.

METAL CLEANERS

Cleaner No. 7 Still, soak cleaner
Cleaner No. 9 Heavy duty soak cleaner
Cleaner No. 12 Reverse current cleaner
Cleaner No. 20 Non-etching Aluminum Cleaner
Cleaner No. 25 Brass Cleaner (non-oxidizing)
Cleaner No. 30 Etching-type Aluminum Cleaner
Cleaner No. 66 Solvent Cleaner (emulsion type)
Special Cleaners—formulated for specific applications.

PROTECTIVE FILM FINISHES

WITCH-DIP, Wax Base Compound
WITCH-OIL, Water Displacing Corrosion Inhibiting Oil
FINISH No. 146, Hard Protective Coating and Paint Bond
SILCO—An inorganic, low-temperature bake, vitreous type finish. Rust, acid and abrasion resistant. All colors.

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MITCHELL-BRADFORD CHEMICAL COMPANY
MODERN METAL FINISHES
2446C MAIN ST., STRATFORD, CONN.

BLACK-MAGIC OXIDE BLACKING SALTS
WITCH-DIP & WITCH-OIL FINAL FINISHES

SILCO *Glass-Base* PROTECTIVE COATING
HEAT TREATING SALTS. CLEANERS. ETC.

as their representative in the Detroit and Michigan area. He will operate out of Holly, Mich. He was formerly with the Gerity-Michigan Corp., Adrian, Mich.

Gerity-Michigan Co., a subsidiary of Gerity-Michigan Corp. of Adrian, Mich., and a large manufacturer and plater of automotive die castings, have received a contract from the Air Force to operate and maintain a pilot plant in Adrian for manufacturing methods.

The Air Force has begun converting the big former aluminum extrusion plant to house some of the largest press machinery in the world. Presses weighing 15,000 and 7,500 tons shipped here from Germany will be included in the equipment to be installed. James Gerity, Jr., president of the Gerity-Michigan Co., recently returned from Germany where he studied heavy presses and their use. During the war, Germany used the presses to turn out about 700 airplane propellers in an 8 hour shift. Plants in the U.S. could produce only 40 to 50 propellers in the same period, it is claimed.

The Air Force emphasized that the plant would be used only for experimental and research activity. However, it could easily be utilized for full scale production in the event of a national emergency.

Howard Plating Industry has recently completed a 4000 square foot addition to their present plant in Royal Oak, Mich. The new addition was necessary to alleviate a serious stock storage problem. This firm is now engaged in cadmium and zinc plating on a jobbing basis.

Harding Mfg. Co., 10600 Gratiot, Detroit, has revamped their copper, nickel and chromium line to handle all types of bases metals including aluminum. Increased business made the change necessary. Harding Mfg. was the first job shop in Detroit to plate on aluminum as a part of their regular production.

Metals Plated, Inc., 21740 Wyoming, Oak Park, Mich., announces the addition of a gold and silver plating service to their production plating plant. The new service will include custom refinishing and repairing of gold, silver and antique articles and is designed to meet the needs of the jewelry trade and the public. *E. L. Beichtol*, president, who has been in plating work for 40 years, originally worked for Wm. Rogers and, in addition, manufactured holloware. A pick-up and delivery service is available for Detroit and its metropolitan area. This shop also plans to initiate a nationwide advertising program in October designed to reach the smaller towns and areas that are not serviced by any plating shops. They plan to refinish automotive parts particularly for garages and persons located in such areas.

Manufacturers' Literature

Anti-Rust Protective Oil

Oakite Products, Inc., Dept. MF, 18 Thames St., N. Y. 6, N. Y.

This firm has announced the publication of a 16-page, illustrated booklet providing interesting descriptive data on Oakite Special Protective Oil, a material which is designed to give semi-permanent rust protection to metal parts during production, in storage or while awaiting shipment.

Oakite Special Protective Oil is claimed to be an efficient rust-preventive oil of extremely low viscosity which imparts a thin, protective film to ferrous surfaces, resisting moisture, humidity, perspiration, residues and acid fumes. This film does not alter dimensions or surfaces of finely finished parts, nor is it necessary to remove it for gauging and similar in-

spection procedures, or for soldering or welding of light-gauge metals, according to the firm. It displaces water or moisture on metal surfaces; when rinsed parts are immersed in this oil, water sinks to the bottom of the tank, thus prolonging solution life. Under ordinary circumstances, the exceptional water-dispelling action of this material is said to eliminate the need for pre-drying of parts after rinsing or degreasing and before applying the protective oil. For between-operations protection in metalworking plants, tank-immersion method is usually employed, but easy application of this material may also be made by brushing, swabbing or spraying.

Tygon Tubing Booklet

U. S. Stoneware Co., Dept. MF, P. O. Box 350, Akron 9, Ohio.

This 24 page booklet gives complete information on all formulations of Tygon plastic tubing—its uses, properties and chemical resistant characteristics. Most any question that could be asked about Tygon Tubing is answered in this bulletin, No. T-77. A copy can be had by writing to the above address.

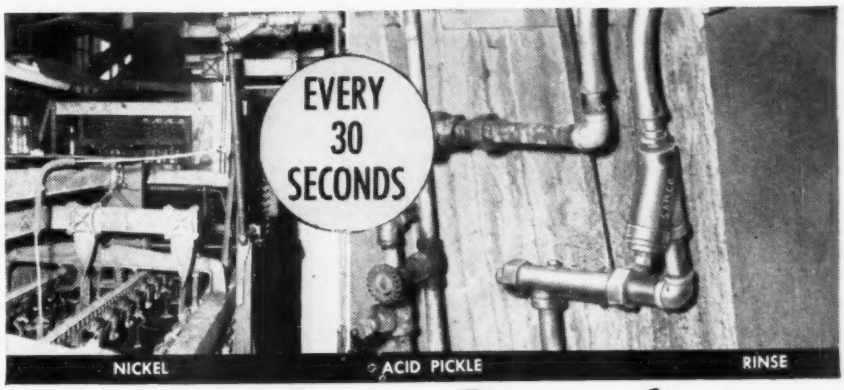
Bulletin on Cleaners

The Diversey Corp., Dept. MF, 53 W. Jackson Blvd., Chicago 4, Ill.

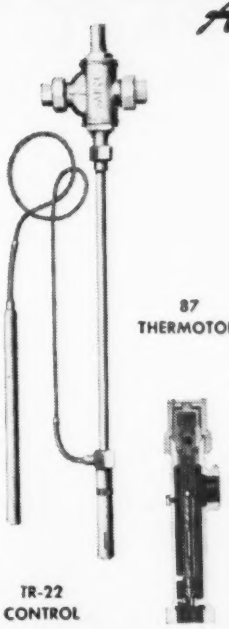
The Metal Industries Dept. of The Diversey Corp. now has available three new pieces of informative literature concerning the characteristics, applications, and production records of two of their products and one of their processes.

Diversey No. 12, a reverse current electrocleaner for steel, copper, and copper alloys, and Diversey No. 36, an alkaline, non-etching aluminum cleaner, are each thoroughly discussed in two of the file folder type pieces of literature. The characteristics, advantages, and specific uses of the products are presented in both printed form and in pictures. One full page of each folder presents actual histories of installations of these products showing both dollars and cents savings and advantages not readily convertible into dollars and cents.

The third folder, a twelve-page manual, is a technical presentation of The Diversey Pre-treatment of Aluminum for Spot Welding. Pictures, charts, and graphs add to the completeness of this literature, and very interesting case-histories support the claims for this process.



A Perfect Plating Operation



Automatic plating units never wait. When they hit the tanks, the temperature must be right and in less than a minute the job must be done—right. In the busy plating plant illustrated, every step is temperature controlled—sometimes with the inexpensive Sarco No. 87 Trap-Control—at others with the more exacting TR-22 control.

The result is mass production with a high accuracy that is repeated, day in and day out. Reduction in the number of rejects paid for these controls in a few months. And the strange thing is that less heat is wasted when perfect plating is secured with Sarco Controls.

Eventually you will find your plant in competition with temperature controlled plating. Why not look into the question now and save the original cost of the controls over and over for years to come? The Sarco Representative near you will be glad to show you how. Ask for Sarco Catalog No. 650 on plating and finishing controls.

186

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SARCO COMPANY, INC.
Represented in Principal Cities
Empire State Building, New York 1, N. Y.
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Acid Proof Drain Line Items

The Duriron Co., Inc., Dept. MF, Dayton 1, Ohio.

Price List H-2, just issued, illustrates all Duriron Acid-Proof equipment now available for handling corrosive wastes from chemical laboratories, engraving shops, chemical plants, plating rooms, steel mills and many other places.

The most notable design improvement is the use of cap style cleanouts and C clamps. Due to the physical characteristics of high silicon iron, all previous methods of construction have required cast threads and loose fits. Also, it reduces to a minimum the area of metal that can be subjected to corrosive attack from trapped solutions.

Duriron Acid Proof sinks, sink strainers, floor drains, traps, pipe and fittings have been used for handling corrosive wastes for well over 30 years.

New Nox-Rust Application Chart

Nox-Rust Chemical Corp., 2129 S. Halsted St., Chicago 8, Ill.

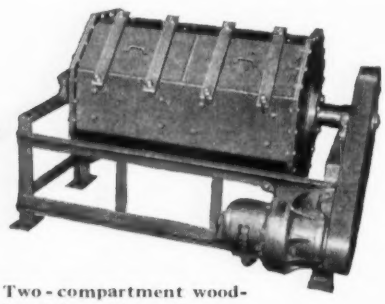
The above firm announces that its Rust Preventive Use Chart, which has long been a valuable aid to manufacturers of metal products, especially those supplying the United States Government, has now been brought up-to-date, and is available on request.

This chart is a comprehensive source of authentic data for rustproofing metal parts for protection against the elements. It gives, in easy-to-read

A TUMBLING BARREL FOR EVERY PURPOSE

Yes . . . Henderson can supply you with tumbling equipment in a variety of sizes, shapes and materials for practically every tumbling requirement. Nearly three quarters of a century in designing and manufacturing tumbling barrels for the GRINDING, BURNISHING, POLISHING and CLEANING of metal stampings, balls, bearing races, forgings, small castings, screw machine products, jewelry, wire forms and small metal parts. Tilting type barrels of Steel, Wood or Alloy Metal . . . Horizontal type barrels of Cast Iron or Cast Steel. Wood or rubber lined in all Models. Also special barrels for plastics.

#5A Motor Driven Tilting Oblique Tumbling Barrel.



Two-compartment wood-lined Burnishing Barrel.

If your requirements call for faster production and finer quality at lower cost or if you require Tumbling Barrels of special design, our Development and Engineering Service will be glad to make recommendations.

Write for further information.

Since 1880 - Designers and Builders of Tumbling Barrel Equipment

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tabular form, the correct rust protection methods for metal parts to be stored either indoors or outdoors, describes the application and removal of rust preventive materials, and designates the most suitable Nox-Rust Product to be used. It indicates minimum protection periods, gives a physical description of each Nox-Rust Product, and other miscellaneous data.

In addition, it lists United States Government Specifications as required by various branches of the service. Wherever metal parts must be protected to insure that they will be rust-free on arrival, this newly revised Nox-Rust Chart is a practical necessity. Copies will be supplied without cost or obligation.

TECHNICAL LITERATURE

Abrasives — Their Manufacture and Use in Germany During the Period 1939 - 1945

British Intelligence Objectives Sub-Committee Overall Report No. 26. Obtainable from British Information Services, 30 Rockefeller Plaza, New York 20, N. Y. Price 15 cents.

Covers the manufacture of artificial abrasives, abrasive factories, manufacture of grinding wheels, grinding wheel factories, manufacture of abrasive cloths and papers, and a list of relevant reports. Various steps in the processing of the above products are mentioned, together with a brief description of any unusual methods or equipment in use in these plants. Production figures are also given.

Specifications and Tests for Electrodeposited Metallic Coatings

American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. Price $1.25.

The 1949 edition of this publication, sponsored jointly by *American Society for Testing Materials* and *American Electroplaters' Society*, brings together in convenient form all of the standard specifications and test methods pertaining to electrodeposited metallic coatings on metals. These two organizations have been cooperating for years in research and standardization work. The A.S.T.M. activity in this particular field is carried out by its Committee B-8 on Electrodeposited Metallic Coatings.

In the compilation are specifications for various types of electrodeposited coatings on steel, i.e.: zinc, cadmium, nickel and chromium, and lead. There are specifications for electrodeposited coatings of nickel and chromium on copper and copper-base alloys, and on zinc and zinc-base alloys; also a specification which covers chromate finishes on electrodeposited zinc, hot-dipped galvanized, and zinc die-cast surfaces.

Two methods are given, one covering test for local thickness of electrodeposited coatings, and the other salt spray (fog) testing.

Included also are the following recommended practices: chromium plating on steel for engineering use, and the preparation of low-carbon and high-carbon steel for electroplating.

Associations and Societies

AMERICAN ELECTROPLATERS' SOCIETY

Los Angeles Branch

Water treatment and its application to the plating industry was discussed

by *Harold F. Fouts*, consulting chemical engineer, who appeared as the principal speaker at the February 8 meeting of Los Angeles Branch.

The speaker's specific subject was de-ionization for the purification of water, and treatment of liquids by ion exchange. He described de-ionization as a chemical exchange and absorption carried out in a two-step cycle. In describing the difference between distilling and de-ionizing, he declared that distillation requires a large source of heat, cooling coil, pumps, power, extra water supply and close attention, whereas de-ionization needs only a few tanks, simple valves and a minimum of piping and attention.

While rinse water and solution water for plating purposes does not require the absolute purity demanded in some industries, Mr. Fouts stated that removal of excess salts through de-ionization of plating shop water will diminish the hazard of water spots on finished parts and improve the plating bath.

Water, he explained, contains objectionable ions of calcium, magnesium, sodium and heavy metals. In de-ionization, these cations are drawn into the structure of an insoluble granular resin solution in the de-ionization unit. The molecular structure of the resin contains nuclear sulfonic acid molecules, the hydrogen of which is replaceable by metallic ions or cations. In the de-ionization process, the objectionable cations are sucked into the resin and an equivalent number of hydrogen molecules released, which then unite with the anions of the split salt to form the corresponding acid. The raw water contains salts of calcium, magnesium and sodium—sulfates, chlorides and carbonates. The products of the exchange are acids—sulfuric, hydrochloric and carbonic.

The speaker, by means of equations, demonstrated how the cation exchange takes place, the method of acid absorption, and how objectionable amounts of CO_2 in the purified water can be removed, either by bringing it to a low point by aeration, or degassifying it under a vacuum. The mechanical details of de-ionization units, the method of regenerating, and types of regenerants were also described.

President *Allen Sulzinger* presided over the business session. *Donald H. Van Zule*, plating supt. of the Hollywood Hardware Mfg. Co., was initiated into membership. The following guests were introduced: *Dr. R. M. Thomas*, Reed Manufacturing Co.; *Don Hogan*, Baron Industries; *John Wickham* and *D. E. Miller*, Kelite Products, Inc.; *C. P. Simon*, Barber-Webb Co.; and *Jerome L. Bleiweis*, Coast Painting and Chemical Co.

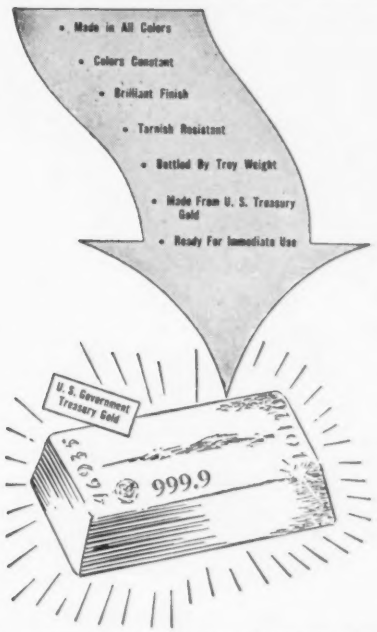
Secretary *Myron Orbaugh* announced plans for a new method of conducting the employment service of the branch. Shop owners and foremen will be requested to send job requests to the secretary, who will include job openings and jobs wanted columns in the monthly meeting announcement. If an employer needs a man immediately to fill an opening, he can get spot service by contacting Mr. Orbaugh, who will then advise him of the availables on his list. The employment service will be operated in collaboration with the Metal Finishing Association of Southern California, an organization confined to plating shop operators.

A final report on the plating demonstration given over television station KTLA on January 8 by a cast of AES members indicated that in excess of 100,000 persons saw the demonstration. The video show was presented through the generosity of the American Chemical Society, which set aside 15 minutes of its weekly Science Page of the Week period to the Los Angeles Branch of the AES. While the demonstration was pronounced an unqualified success, follow-up plating programs are doubtful, due to the cost involved if programs were to be financed by the AES Branch.

DAVIS-K

GOLD & RHODIUM SOLUTIONS

GOLD and RHODIUM PLATING SOLUTIONS HEADQUARTERS


• Made in All Colors
• Colors Constant
• Brilliant Finish
• Tarnish Resistant
• Bottled By Troy Weight
• Made From U. S. Treasury Gold
• Ready For Immediate Use
U. S. Government Treasury Gold
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DAVIS-K—makers of GOLD PLATING SOLUTIONS—prepared in all colors that produce hard, tarnish-resistant, color constant deposits. Compounded from U. S. Treasury GOLD and highest (C.P.) chemicals. Sold by troy weight—certified 100% gold content. Solutions are simple to operate and maintain.

DAVIS-K GOLD SALTS—We are now making the finest in potassium and sodium gold cyanide salts. These salts come in standard percentages, unconditionally guaranteed as to fine gold content.

We welcome inquiries pertaining to precious metal plating problems.

Distributors of Bakers' lustrous RHODIUM SOLUTIONS, that produce a long-lasting white finish.

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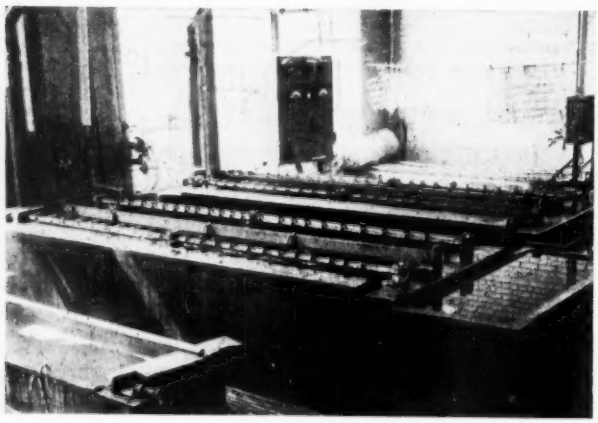
DAVIS-K PRODUCTS CO.

54 West 22nd Street ORegon 5-0094-5 New York 10, N. Y.

Activity and good fellowship are evident in this Banquet Room scene.



Better Plating with Better Tanks

EXTRA profits are sacrificed when modern process improvements are adopted without utilizing the improvements obtainable in modern plating tank construction. Use Storts Engineering Service to keep your tank specifications up to date and make your operating dollars go further.

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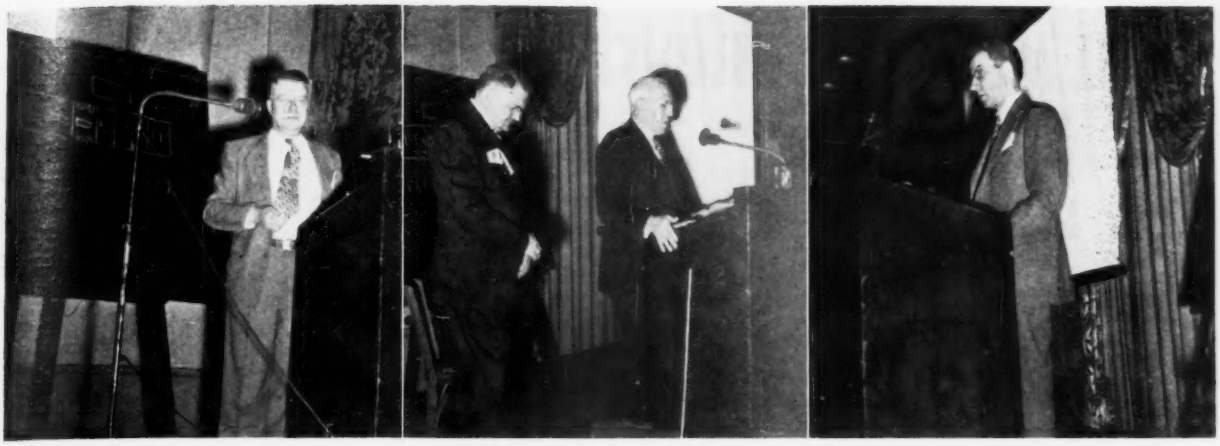

Photos of the various speakers. Left, Dick Hull, of the R. O. Hull Co.; center, Dr. Monaweck, librarian of the Chicago Branch, and Dr. Wm. Blum, of the Bureau of Standards; right, Mr. B. B. Knapp, of the International Nickel Co.

The pictures on this and the opposite page were taken during the recent annual banquet and technical session of the Chicago Branch held at the Stevens Hotel on January 14th. Approximately 250 people attended the afternoon technical sessions, and nearly 1000 members and guests were present at the banquet and dance in the evening. All those present were entertained in a manner which surpassed anything that the branch has ever produced heretofore. The Chicago branch will be the hosts to the Annual Convention of the AES in 1952.

Los Angeles Branch Annual Educational Session

The twentieth annual educational session and dinner dance of The Los Angeles Branch will be held on March 18 at Rodger Young Auditorium, 936 West Washington Blvd., Los Angeles, with Supreme Society President *Arthur W. Logozzo*, of Hartford, Conn., as the guest of honor and principal speaker. Technical sessions will be held from 10 a.m. to noon, and 2 to 4 p.m. A luncheon at noon will carry a taboo on formal speeches.

General chairman *Peter V. Rogers* has announced a program of speakers including *Mr. Logozzo; Dr. M. M. Beckwith*, manager of technical sales, Harshaw Chemical Co., Cleveland, O., and *John Davis*, chief engineer of the Udylite Corp., Detroit, Mich. There will also be a local speaker on the

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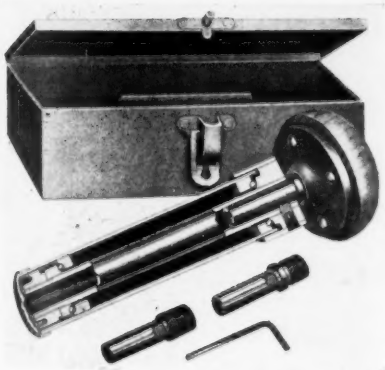

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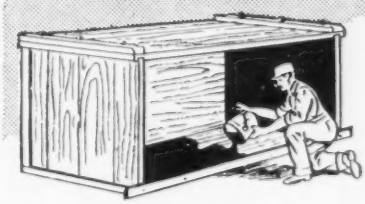

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timely subject of "Economics of Plating."

The annual dinner dance will be held in the main ballroom of Rodger Young Auditorium on the night of March 18, beginning at 8 p.m. Door prizes will be awarded in the form of useful and decorative plated articles which, during the day, will form a part of the plating industry products and equipment exhibition on display in the auditorium.

A. E. S. Sponsors Columbia Plating Research

Columbia University's Dept. of Chemical Engineering is conducting basic research in electroplating under an annual $1700 grant from the American Electroplaters' Society. The study is a cooperative research project of the metal finishing industry.

The grant provides for a $1200 fellowship and an additional stipend of $500 for the department, to support the research. The first holder of the fellowship is *Edward B. Saubestre*, a matriculated Ph.D. candidate. Under the terms of the fellowship, Saubestre is permitted to combine his research work with his doctoral studies.

The work is being conducted under the direction of Profesor *Henry B. Linford*, of the Chemical Engineering Dept.

A. E. S. FOUNDER MEMBERS TO BE HONORED

Information Wanted

It is planned to honor the Founder Members of the *American Electroplaters' Society* at the Annual Convention in Boston June, 1950. Before plans can be completed and announced, we desire to learn whether any of the early members of the National Electroplaters' Association in 1909 and the American Electroplaters' Society in 1913 listed below are still living and, if so, where they may be reached.

Theodore Bartlett
William Bryer
W. E. Churchill
Fred C. Clement
Herbert W. Cummings
E. B. Davidson
Otto Dennowitz
R. Downey
C. Dreher
Frank Duffy
Fred Eberwein
C. O. Field
Wm. G. French
C. D. White
F. J. Frost
Louis Gaenicke
John E. Grant
A. D. Havens
J. F. Hubbs
J. M. Kerhart
James Meldrum
William McConnell
L. A. Peterson
Franklin Sheldon
George Whalen
E. D. Van Arsdale
J. F. Meinke
G. W. Cooper

Readers having information on any of these or other early members are requested to send it to the Executive Secretary, American Electroplaters' Society, P. O. Box 168, Jenkintown, Pa.

Rochester Branch

The Rochester Branch of the A. E. S. met Monday, January 16, at their new meeting place. The Rochester Institute of Technology.

President *Joe Hull* presided over the meeting which was attended by 43 members and 2 guests. The branch seems to be starting off the year 1950 with a "clean slate" as there was no old or new business to be brought up at this time.

Three applications for membership to the branch were accepted as fol-

lows: *Mr. Joseph Diesinger, Mr. John T. Brennan, and Mr. Thomas J. Baker.*

The branch was honored to have as its speaker for the evening one of its honorary members, *Mr. G. A. Lux.* "Gerry," who has in the past contributed a great deal of his time in teaching Chemistry and fundamentals of plating to members of this branch, is now with The Oakite Products, Inc. Gerry's subject for the evening was, "Some Fundamentals of Electrocleaning." The speaker was true to old form at putting his subject matter across and all were better informed of this very important subject of cleaning.

AMERICAN SOCIETY FOR TESTING MATERIALS

Committee Week in Pittsburgh

A.S.T.M. Committee Week will be held in Pittsburgh, Pa., at the William Penn Hotel during the week of February 27, 1950. Subcommittee meetings will precede the main meeting of the committees and meetings will run simultaneously or in sequence as the committees have specifically requested, or as has been their custom in the past.

The following committees, and their subcommittees, are among those scheduled to meet:

A-5 on Corrosion of Iron and Steel
B-3 on Corrosion of Non-Ferrous Metals and Alloys
B-8 on Electrodeposited Metallic Castings
D-1 on Paint, Varnish, Lacquer, and Related Products
D-19 on Industrial Water
E-1 on Methods of Testing (subcommittees only)
E-4 on Metallography
E-12 on Appearance

SOCIETY OF AUTOMOTIVE ENGINEERS

Plating Wastes To Be Discussed at Meeting

The meeting of the Society of Automotive Engineers being held at the Book-Cadillac Hotel in Detroit on March 14 will feature a symposium on waste controls. Papers will be presented by a panel of distinguished speakers on controlling plating wastes, disposal of acid wastes, removing soluble oils from waste water, and smoke abatement. *Mr. L. A. Danse,* of General Motors, is chairman of this symposium.

NATIONAL ASSOCIATION OF CORROSION ENGINEERS

A tentative schedule of symposia and technical papers to be presented at the Sixth Annual Conference of the National Association of Corrosion Engineers on April 4-7 at the Jefferson Hotel, St. Louis, Mo., is as follows:

Afternoon, April 4

"The Role of Polarization in Corrosion," R. H. Brown and R. D. Williams.

"The Influence of Stress on Corrosion," Julius Harwood.

Morning, April 5

"The Behavior of the Chromium-

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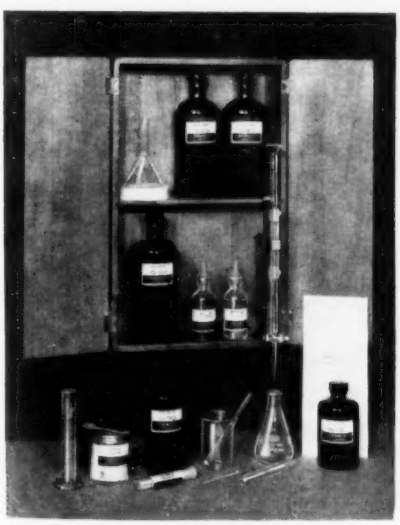

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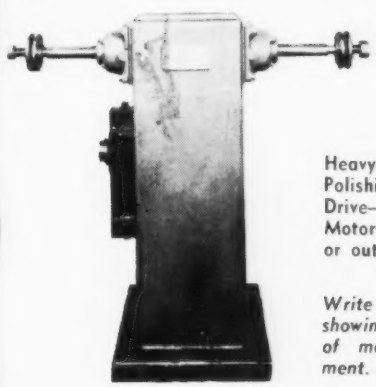

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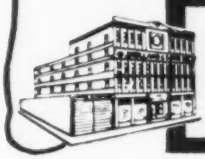

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Nickel Stainless Steels in Sulfuric Acid," G. C. Kiefer and W. G. Renshaw.

"Corrosion of Metals by Insecticidal Solutions," G. S. Cook and N. Dickinson.

"Corrosion in Sulfur Production. The Use of an Alloy Protective Coating," N. Hackerman and D. A. Shock.

"Corrosion of Metals in Fluorine and Hydrofluoric Acid," G. C. Whitaker.

Morning, April 5

"Design of Anode Systems for Cathodic Protection of Underground and Water Submerged Metallic Structures," E. R. Shepard and H. J. Graeser.

"A Study of Metals for Use as Permanent Anodes in Water Tank Cathodic Protection Systems," A. L. Kimmel.

"Cathodic Protection of an Active Ship in Sea Water," G. L. Christie.

"The Performance of Magnesium Galvanic Anodes in Underground Service," O. Osborn and H. A. Robinson.

"Corrosion in Condensate and High Pressure Sweet Oil Wells," R. C. Buchan.

"Corrosion in Coke By-Product Industry" (Tentative Title), E. A. Tice, and C. F. Pogacar.

"Unusual Corrosion in a Crude Distillation Unit" (Tentative Title), D. L. Burns.

"Protective Coatings," J. P. Barrett.

"Deterioration of Diesel Engine Liners," F. L. LaQue, and F. M. Speller.

"Problems in Corrosion of the Railroads," R. McBrian.

"Corrosion Problems of Aircraft Exhaust Systems," O. E. Kirchner and F. M. Morris.

Morning, April 6

"Surface Preparation Values and Sandblasting Economics," A. J. Liebman.

"Flame Sprayed Plastic Coatings," B. Goldberg.

"A Progress Report on the Use of Cathodic Protection in Conjunction with Protective Coatings," W. L. Crosby.

"Ohio River Division Corrosion Problems," J. A. Davenport.

"Comparative Performance of Killed and Rimmed Steel in Salt Water," V. V. Kendall.

"Electrochemical Behavior of Zinc and Steel in Aqueous Media—Part II," R. B. Hoxeng.

"Cathodic Protection of Fourteen Offshore Drilling Platforms," E. P. Doremus and G. L. Doremus.

"Corrosion Resistant Equipment for the Corn Refining Industry," R. W. Flournoy.

"Metals Used in the Dairy Industry," C. Y. McCown.

"Some Aspects of the Corrosion of Tin Plate by Prunes," V. W. Vaurio.

"Surface Potential Method of Corrosion Survey on Pipe Lines," O. W. Wade.

"Internal and External Corrosion Prevention in a Products Pipe Line," S. S. Smith, E. H. Rush, and W. J. Curry.

"Training Program for Corrosion Technicians," J. R. Cowles.

Morning, April 7

General Corrosion Problems Round Table.

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Zinc Institute Announces Annual Meeting

The American Zinc Institute announced today that its Thirty-Second Annual Meeting will be held at the Hotel Statler, St. Louis, Mo., on Tuesday and Wednesday, April 11th and 12th.

Qualified speakers will discuss the outlook for metals generally and the trend of zinc production and consumption in the current year. Government officials will contribute their views with respect to mining at home and the world zinc situation.

The annual dinner and smoker will be held on Tuesday evening, April 11th.

News from California

Turco Celebrates Greatest Sales Year

1949 was the greatest sales year in our company's history, *Sydney G. Thornbury*, president of *Turco Products, Inc.*, announced at the twenty-third annual Turco management conference held recently in Los Angeles.

During 1949, a new factory was established at McCook, Ill., to supplement plants already operating in Los Angeles, Chicago and Houston.

L. H. Moulton, Turco vice president and national sales director, presented a special citation to *George J. Scherer*, manager of the Southern California sales district, at the conference's dinner meeting, for having the company's best sales record of 1949.

The same meeting heard Moulton discuss sales objectives for the coming year, marketing strategy for newly-developed materials and compounds, new merchandising techniques and details of 1950's advertising and sales promotion activities.

In addition to Los Angeles executives, the meeting was attended by Turco regional sales executives from the company's ten sales districts. Here

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for the meeting were *J. D. Charters* and *Chris H. Williams*, of Houston; *T. Few Brown*, of New York City; *A. K. Beard*, of Cleveland; *W. L. Donovan* and *Charles F. Devine*, of Chicago; *Samuel B. Hewlings*, of Philadelphia; *A. H. Massey*, of Atlanta; *George J. Bruns*, of Kansas City; *E. J. Brodersen*, of Seattle; *Al Martinez*, of San Francisco, and *George J. Scherrer* and *James L. Sweatt*, of Los Angeles.

Matchless Appoints West Coast Representative

The Matchless Metal Polish Company and its subsidiary, Advance Polishing Wheels, Inc., take pleasure in announcing the appointment of *Mr. Sam B. Crooks*, 1401 Santa Fe Avenue, Los Angeles 21, Cal., as their West Coast representative. Mr. Crooks has long been associated with the metal finishing industry. His years of practical experience enable Mr. Crooks to offer engineering assistance and proper service when it is needed. Mr. Crooks will have a direct factory connection with home offices, and will carry adequate stocks of all Matchless compounds and a stock of all types of buffs. Mr. Crooks will be in a position to keep the West Coast finishing trade in close touch with any new developments or techniques and to be of service on any problems in finishing that might arise.

Virgil to Represent L. H. Butcher

Mr. Jack A. Raskin, manager of the metal finishing div. of the *L. H. Butcher Co.*, Los Angeles, announces the promotion of *Mr. Frank Virgil* to sales representative.

Mr. Virgil was in charge of the metal finishing office and order desk, and has had many years experience in the protective coating field.

Jerry Bleiweis, who formerly operated the Bright Plating Co. in New York, is now a member of the laboratory research staff of the Coast Plating & Chemical Co., Los Angeles.

George Masters has been named sales engineer for Hollywood Bronze Supply Co., Hollywood, Calif. Masters formerly served in a sales capacity with Kelite Products, Inc.

Finishing shop expansion which doubled the floor space, added considerable new equipment, and increased the shop force to 50 men is reported by *Donald A. Van Zile*, plating superintendent of Hollymade Hardware Mfg. Co., Los Angeles.

The company produces door hardware, lock sets and cabinet hardware, for the finishing of which it operates cadmium, nickel, brass, bright copper, bright nickel, barrel and spot plating facilities. Remodeling of the shop included converting the cadmium set-up to zinc. Three new polishing lathes are among the equipment installed.

A course in the science and practice of electroplating was inaugurated by the extension division of the University of California, at Los Angeles, on February 7. The class is held every Tuesday evening from 7 to 9:30 o'clock and will continue for 18 weeks. The instructor is *Mitchell Raskin*, superintendent of the finishing department of the Globe Lighting Products, Los Angeles, who has served as plating instructor in similar courses in previous years. The course is announced as a comprehensive survey of the science, techniques and practices involved in the various methods employed in

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electroplating for those engaged in some aspect of the field who wish to broaden their knowledge and experience.

The American Society of Metals, American Foundrymen's Society and American Welding Society are collaborating in sponsoring a course in practical metallurgy and engineering metals and alloys at the East Los Angeles (Calif.) Junior College. The class is scheduled for each Monday night from 7 to 9 o'clock, from January 30 to June 17. The sequence of studies will present a practical course in shop metallurgy, including consideration of the basic metallurgy of iron, steel and non-ferrous alloys.

E. R. Babylon, sales metallurgist of Kaiser Steel Corp., has been transferred from the Los Angeles branch to the firm's headquarters in Oakland, Calif., to direct the sale of Kaisaloy, a new light-weight alloy steel produced by the Kaiser Co. Babylon was formerly chairman of Los Angeles Chapter, American Society of Metals.

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350/175	7½-15	1200	Roth	220-3/60
500/250	6/12	1200	American Giant	
1000	6	1200	H. V. W.	220-3/60
1500/750	6/12	900	Electric Prod.	440-3/60
2000/1000	6/12	600	H. V. W.	220-3/60
2000/1000	6/12	600	Chandeysson	220-3/60
3000/1500	6/12	720	Meaker	220-3/60
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